3

Registered by Australia Post — publication No. NBP 0240

Australia's Top Selling Electronics Magazine

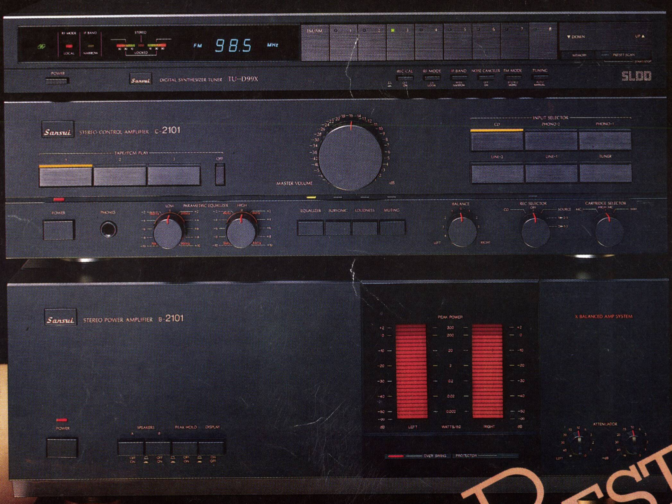
Electronics Australia

FEBRUARY
1986
Aust* $2.75
NZ $3.50

THE 1986 HIFI AWARDS

☆ *Best* **AMPLIFIER**
☆ *Best* **RECEIVER**
☆ *Best* **TURNTABLE**
☆ *Best* **AM/FM TUNER**
☆ *Best* **CD PLAYER**
☆ *Best* **LOUDSPEAKERS**
☆ *Best* **CASSETTE DECK**

BONUS: 84-PAGE ALTRONICS ATALOG


Sansui DIGITAL SYNTHESIZER TUNER TU-D99X
FM 98.5 MHz
SLDD
Sansui STEREO CONTROL AMPLIFIER C-2101
MASTER VOLUME
INPUT SELECTOR
Sansui STEREO POWER AMPLIFIER B-2101
PEAK POWER
X BALANCED AMP SYSTEM

TU-D99X SLDD Digital Synthesizer Tuner
C-2101 Stereo Control Amplifier
B-2101* X-Balanced Power Amplifier

X BALANCED AMP

*RMS power output: 200 watts × 2 (8 ohms),
20Hz – 20kHz, less than 0.003% THD.
Dynamic power output: 680 watts × 2
(2 ohms).

OWN THE BEST

The best is only as far away as your nearest Sansui dealer.

Sansui

SANSUI ELECTRIC CO., LTD. 14-1 Izumi 2-chome, Suginami-ku, Tokyo 168, Japan
VANFI (AUST.) PTY. LTD. 297 City Road, South Melbourne, Victoria 3205, Australia Tel: 690-6200
283 Alfred Street, North Sydney, N.S.W. 2060, Australia Tel: 929-0293

THIS MONTH'S COVER

Pictured on the front cover is the Yamaha R9B, one of the winners of this year's hifi awards. You can find out about the other winners by turning to page 8.

Electronics Australia

Volume 48, No 2
February 1986

Features

16 **SOUND WAVES AND HOW WE HEAR THEM** *New hifi series*
80 **PRACTICAL ELECTRONICS PT. 5** *How to troubleshoot projects*
100 **COMPACT DISC DIRECTORY PT. 2** *Special supplement*

Entertainment Electronics

8 **THE 1986 HIFI AWARDS** *All the top products*
26 **HIFI REVIEW** *Philips CD555 portable music system*

Projects and Technical

26 **BUILD A RADIO DIRECTION FINDER** *Track down hidden transmitters*
38 **CAR DASHBOARD LAMP FLASHER** *The "Claytons" burglar alarm*
42 **THE AM3 WALKABOUT RADIO** *For good quality sound*
52 **THE SERVICEMAN** *Nothing to CRO about in this story*
58 **PLAYMASTER STEREO AM/FM TUNER PT. 3** *The construction details*
68 **CIRCUIT AND DESIGN IDEAS** *Simple car burglar alarm*

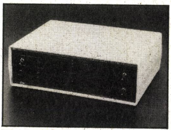
News and Comment

4 **NEWS HIGHLIGHTS** *Computerised textile design*
14 **LETTERS TO THE EDITOR** *Star Wars is not the answer*
72 **FORUM** *Artificial intelligence: who's kidding whom?*
118 **INFORMATION CENTRE** *Answers to problems*

Departments

14 **COMING NEXT MONTH**
78 **BOOKS AND LITERATURE**
86 **NEW PRODUCTS**
114 **50 AND 25 YEARS AGO**
120 **MARKETPLACE**
121 **EA CROSSWORD PUZZLE**
119 **NOTES AND ERRATA**

Radio Direction Finder



Want to find out where a radio signal is coming from? Or locate an illegal transmitter? This radio direction finder will track it down using an electronically rotated antenna. Details page 26.

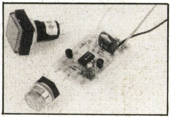
What's coming

Next month we will present a special feature on AM stereo and describe a digital strobe circuit. See page 14 for further details.

Record reviews

Because of the length of the CD directory, we will be delaying the introduction of our CD reviews until the list is completed.

Dashboard lamp flasher



This is the "Claytons" car burglar alarm — the alarm you fit when you can't be bothered fitting a real alarm. It's both easy to build and easy to install (see page 38).

News Highlights

Resurrection of an old IC logic

Ferranti Electronics Ltd of the UK has resurrected an obsolete bipolar logic form called differential current-mode logic (DCML). DCML is being used to develop a prototype 16-bit multiplier that can combine very high speed with a limited power consumption.

Its main attraction has been its ability to reject common-mode noise. Using the differential long-tail pair has the advantage of cancelling out spurious signals, crosstalk and noise.

Why has this once discarded logic circuitry (which was unpopular because of the circuit complexity that came with carrying signals on two lines instead of one) found itself in favour again? Firstly it comes down to the cuts in power that it can affect and secondly: advances in computer-aided-design (CAD), technology have made the circuit complexity invisible to the logic designer.

Furthermore, logic circuits designed from stacked DCML gates perform their functions in fewer cycles than their equivalent single-logic-level circuits. This makes the whole process up to four times faster. The power use also is reduced which is an added bonus.

The final product, developed by Ferranti and used in airborne radar systems, is a single chip multiplier that consumes 1 W of power as compared to a board full of chips which would consume 16 W. It can multiply two 16-bit values in 25 nanoseconds.

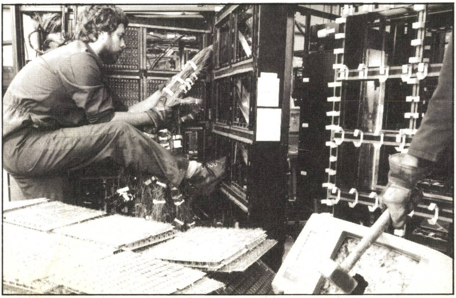
The hardware "hackers"

Looking like a scene from a computer enthusiast's nightmare, this is the first stage in a process that recycles redundant computer hardware into steel, copper, aluminium and precious metals for tomorrow's industry.

Screens once studied by clerks are unmercifully smashed — to prevent them exploding — while the miles of cable that carried complex programs are pulled out and stripped for their copper.

Hundreds of tonnes of computers are scrapped each week. One company, Walmax Processing has invested 1.5 million pounds in a refinery to extract and purify the palladium, silver and gold that are widely used on the circuit boards of an average computer system.

The British company will extract some 6,000 ounces of gold this year and, with offices already operating in France, Italy and Germany, it intends registering with the London Metal Exchange as a supplier of gold bullion.



Computerised textile design

Called the Dobby Designer, this equipment allows the weaver/designer to enter draft patterns and see the likely effects in "fabric" form on the colour screen. Any pattern which appeals can then be woven in cloth on the loom.

Once the pattern has been passed over from the screen by a BBC microcomputer, the loom's controller gives the selection of shafts in the correct sequence so that the cloth is woven to the chosen design. The design can be revised as the cloth is being produced.

On-screen design of textiles is possible in eight colours and the pattern can be built up and recorded on a floppy disk, making the production of samples of cloth simpler and quicker.

Traditionally, many designers turn their sketches into sample cloths by manually setting up a small hand loom — a process which is tedious and time consuming.

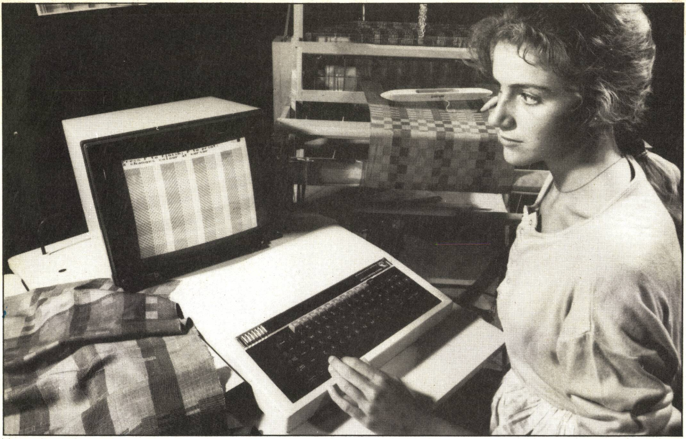
With this method, the pattern is composed in detail on the screen and the data fed from disc to loom controller, allowing lifts and shafts to be selected to produce the corresponding pattern in the woven cloth.

Plasma display seminar

OKI Electric Industry Co. is a leading Japanese manufacturer of Plasma Displays. Their range is from two lines of 32 characters to 24 lines of 80 characters. In conjunction with Amtex Electronics, a one-day seminar on the subject of plasma displays is planned, covering topics such as: comparison of various display technologies; how plasma displays are manufactured; current applications and technical aspects of designing with plasma displays.

The seminars are planned for Adelaide (24th February), Melbourne (25th February) and Sydney (27th February).

For further information, contact Amtex Electronics on (02) 728 2121.



The controller has a memory able to deal with a weaving pattern of up to 480 lifts. In addition, the lift pattern is divisible into as many sub-patterns as the designer requires. The controller can also be instructed to repeat patterns automatically.

Dial an advert

Japan's national telecommunications company, Nippon Telegraph and Telephone (NTT), is out to find a new source of revenue to replace the loss of its lucrative monopoly on long-distance calls due to deregulation.

The plan is to sell a new advertising medium — the telephone call. The latest space for advertisers is now only a ring away.

Two methods are being tried. A company may have consumers who ring their stores listen to a 10-second promotion and then, at no expese to the caller, be put through to the wanted number.

Alternatively, information operators will read an advertiser's message to anyone ringing for a particular phone number in the advertiser's specific field.

The final attempt to improve NTT's lagging profile involves distributing bottles of private label shochu (a cheap, popular liquor), with the company's name prominently displayed upon it.

Speeding a thing of the past

In Japan it looks as if high speed car chases, which endanger the lives of not only the offender but the police and the public as well, may eventually be averted.

The Japanese National Police Agency has begun testing an infrared camera system which will photograph any speeding motorist and their licence plate, day or night.

Using optical fibre links running from the special camera to the central police computer terminal, information such as speed, time, date and location can be relayed, as digitised images, back to the authorities. Here, the information is matched against lists of repeat offenders and stolen cars and the suspect is on the way to being apprehended.

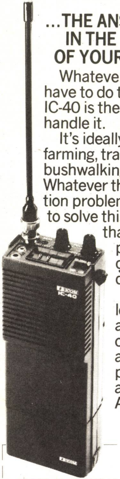
Semiconductor war continues

The battle over semiconductor production and the export and import of these important devices is still continuing between the US and Japan.

The Japanese are anticipating cutbacks to their exports as the US continues to import less and less from them. There is also the added problem of impending legislative action which will correct what the US feels is a trade imbalance in the semiconductor market.

Market pressures are also a major consideration in export cutbacks. The fall off in the US in computer buying indicates that the market will continue to slump.

In Japan the production of semiconductors is still increasing, to the point where in real terms the Japanese will still effectively increase their semiconductor exports to the US. This will further exacerbate the trade imbalance.



"WHICH RADIO DO I NEED?"

...THE ANSWER IS IN THE PALM OF YOUR HAND

Whatever task you have to do the ICOM IC-40 is the one that can handle it.

It's ideally suited for farming, transport, sports, bushwalking & boating. Whatever the communication problem you need to solve this is the radio that's being proven every day in a million different uses.

Contact your local dealer for a demonstration of the most advanced CRS portable available in Australia.

Please post to:

ICOM AUSTRALIA PTY. LTD.
7 DUKE STREET WINDSOR 3182.
VICTORIA.

Name__________

Address__________

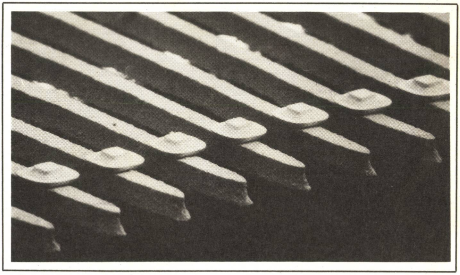
City________ Postcode______

or phone ICOM on (03) 51 2284

ICOM
The World System

IC0014

News Highlights



New semiconductor assembly technology

A new semiconductor assembly technology called Film Carrier Assembly Technology has been patented by Matsushita. The process involves forming electrode bumps which bond leads with an IC chip, resulting in thinner smaller chips.

The bumps are formed on the film carrier, rather than on the IC chips as is done in the conventional film carrier method. The bumps are formed on a glass substrate and are then transferred to the carrier leads. The film carrier is bonded to the IC chip by heat pressing.

According to Matsushita, the new process is much simpler and much less expensive than forming them on a substrate.

Applications in the semiconductor industry include IC card systems, liquid crystal display systems and multiple ICs and LSIs.

New computers for US Space Shuttles

The computers used in the US Space Shuttle are certainly not very reliable. In 20 missions orbiters have suffered five computer failures, two of which have caused 24-hour delays to the respective spacecraft.

The most recent failure, on August 25th, delayed the launch of the orbiter *Discovery*.

IBM began developing the existing systems for the shuttles in 1972, under a timetable that called for five years of pre-flight testing and a first launch in 1979. IBM delivered on time but the rest of the shuttle was not as prompt. All this adds up to the fact that the computing equipment on these orbiters is the best of the early 70s!

In 1987, the shuttle fleet will be fitted with new generation computers which are half the size of the old ones and half the weight. Each of the machines consists of two tape drives holding 134 M-bytes with a core memory of 256K in 32-bit units. The power consumption of the new system is also lower at 550W rather than 650W, and it is faster and much more reliable.

Flat screen pocket TV

The Sinclair miniature pocket TV receiver has recently been released in Australia and will sell for about $399.

Featuring a revolutionary flat-screen cathode ray tube, the pocket receiver is built around a single LSI chip. There are just two controls: on/off, volume and tuner. Power is supplied by a lithium power card which provides 15 hours of life.

The screen size is just two inches (5cm), while the external dimensions are 140 x 90 x 30mm.

SIEMENS

VARISTORS

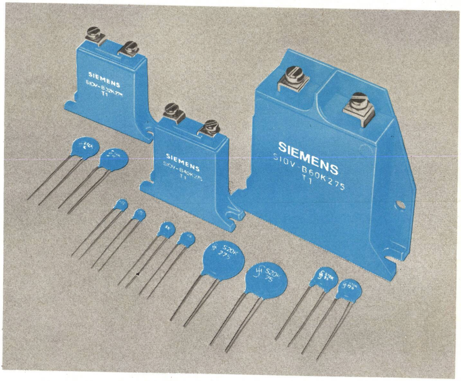
Australia's widest range. All applications. Biggest stocks. Lowest prices. Quickest delivery. What else?

Siemens is now the biggest and best source of varistors in Australia with a full size range for all applications up to 70 kA. This is of special interest to the telecommunications industry. Comprehensive stocks, plus Siemens position as one of the world's largest manufacturers of varistors underwrites our promise of quick delivery and suitability.

Siemens innovation aims at achieving substantial cost reductions across a wide spectrum in the following applications:

☐ Power engineering
☐ Electronic communications
☐ Power electronics
☐ Measuring technique
☐ Processing technique
☐ Office electronics
☐ RFI suppression
☐ Stepped protection

This wide range of varistors is available through Siemens newly strengthened national distributor network. For further information, post the coupon or phone your nearest distributor.



Distributors

Victoria: Promark Electronics (Vic)
(03) 878 1255

New South Wales: Nexus Electronics Pty Ltd
(02) 439 5800
New South Wales: Promark Electronics Pty Ltd
(02) 439 6477

Queensland: ECQ Electronics
(07) 376 5677

South Australia: R.G. Pank Pty Ltd
(08) 51 2411
South Australia: Protronics Pty Ltd
(08) 212 3111

Western Australia: Reserve Electronics
(09) 328 9755

New Zealand: Delphi Industries Ltd
Auckland 563 259

Please mail me the new informative varistors brochure.

NAME ....
TITLE ....
COMPANY ....
ADDRESS ....
....
STATE.................. POSTCODE............

Post this coupon now to Siemens Ltd.
Advertising Department, Melbourne.
544 Church St., Richmond 3121.

Siemens Ltd.
544 Church St., Richmond, Vic.
Melbourne: 420 7318 Sydney: 436 8730
Brisbane: 369 9666 Perth: 362 0123

INGENIOUS ELECTRONIC ENGINEERING

876/2394

Second Australian hifi awards attract big field

CESA hifi Grand Prix awards

The second year of the Australian hifi awards attracted no less than eighty entries and the judges declared winners in all eight categories. One brandname hit the jackpot with awards in two categories: Sony.

by LEO SIMPSON

1986 is the second year that the Australian hifi awards, known as the CESA Grand Prix awards, have been made. By contrast with the inaugural year for the awards, there was no shortage of entries this year so the judges had plenty of work in sorting the leaders from the also-rans.

Just about every major brand was represented, and most of these had entries in more than one category. Let us list each category in turn, and the products submitted.

Amplifiers

This category embraces integrated stereo amplifiers and preamplifier/power amplifier combinations. There were 12 entries in all, ranging in price from a few hundred dollars up to many thousands. Cheapest was the Yamaha A320B integrated stereo amplifier which is rated at 30 watts per channel and priced at $299.00. Dearest was the Nakamichi CA-5 preamplifier and PA-7 power amplifier combination which has a rated power output of 200 watts per channel and a total price of $5000.

We should note that many of the products mentioned in this report have undergone price rises since the judging of the awards, due to the decline in the Australian dollar.

The other amplifier entries were as follows:

Amber Series 70 power amplifier, 70 watts per channel, $1995.00;
Electrocompaniet power amplifier, 75 watts per channel, $2990.00;
JVC A-X500VB integrated stereo amplifier, 100 watts per channel, $979.00;
Luxman LV105 "Brid" integrated stereo amplifier, 85 watts per channel, $1298.00;
NAD 1155 preamplifier and 2200 power amplifier, 100 watts per channel, $1368.00;
Pioneer A-88X integrated stereo amplifier, 120 watts per channel, $1199.00;
Sansui AU-G77X integrated stereo amplifier, 110 watts per channel, $1099.00;
Sharp SM207X integrated stereo amplifier, 40 watts per channel, $1299.00;
Sony TA-F444ES-II integrated stereo amplifier, 100 watts per channel, $999.00;
Technics SU-V10X integrated stereo amplifier, 120 watts per channel, $1329.00.

Amongst these 12 entries are some very good amplifiers and ones which have some quite interesting features. The Luxman "Brid", for example, uses

SONY
CD PLAYER
SONY
UNILINEAR CONVERTER SYSTEM DIGITAL
COMPACT DISC PLAYER CDP-502ES

Sony's CDP-502ES was the winning entry in the CD player category. It has a unique feature: remote volume control.

triode valves in the driver stages of the power amplifiers. It's a strange circuit, with a dual FET differential input stage feeding the triodes which then drive the Mosfet output stages.

Luxman don't do much to justify it though, except for some flowery language in their pamphlet such as, "Superb sonic quality and powerfulness are realised, providing concert-hall realism, non-distorted and glossy feelings, etc".

Sansui's AU-G77X is one of the more unusual entries, laying claim to be "the world's first fully balanced signal amplification and transmission system". It is indeed fully balanced (as described in a number of professional engineering journals) and Sansui claim that the benefit is complete freedom from electromagnetic interference, induced hum and common impedance signals.

It is one of the more powerful entries and claims very good performance figures, such as a frequency response flat from DC to the −3dB point at 200kHz (for the Auxiliary inputs).

JVC's A-X500VB abounds in jazzy user features, such as Gm selector, computer-controlled seven-band equaliser and analyser together with fluorescent bar-graph display, three video inputs (for video dubbing) and a total power output of 110 watts per channel.

By contrast, Yamaha's A-320 would have to be one of the most spartan available, outdoing just about any European model.

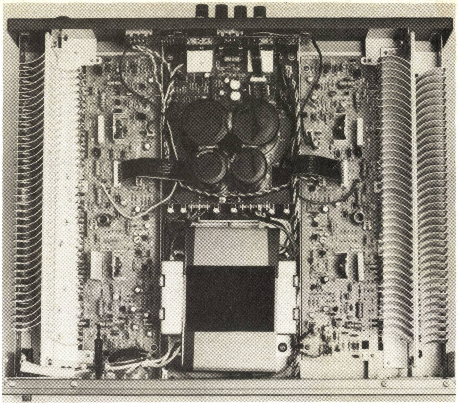
It has five push-buttons for source and mode selection, plus a ganged volume control. Apart from those and a headphone socket, it is devoid of features and so it should appeal to those puritanical types who think that tone controls and any other controls are strictly unnecessary.

Its particular merit is the ability to deliver high music power and drive very low impedance loads to considerably higher power than its modest 30 watt per channel would indicate. It was to rate among the final contenders on performance, price and design merit.

Minor judging hassles

Unfortunately, the Sharp entry for the amplifier category had to be disqualified by the judges as it is only available as part of a complete system, viz, the Sharp 207X(S). This rule was to act against most of the Sharp entries in other categories, since they too were only available as part of a particular mid-sized music system.

In the categories for CD players, loudspeakers and cassette decks, there were instances where more than one entry was made for a particular brand name which is also not allowable under the rules. In these cases, the judges were forced to disallow one entry from each of the companies concerned. This in fact meant that the companies got the benefit of having two entries in. As it happened, the winning result of the particular categories was not affected.



Inside the NAD 2200, which won the best amplifier award.

These quandaries really should have been prevented by the organising committee but inevitably, late entries on the part of some companies would have caused disorganisation.

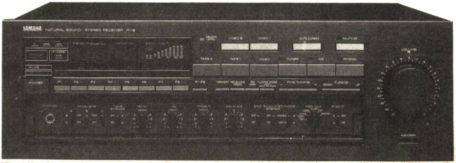
The winning entry was the NAD 1155 preamplifier and 2200 power amplifier combination. The 2200 power amplifier offers exceptional short-term power output (up to 900 watts per channel) plus the ability to operate in bridge mode for even higher mono output, and has such innovative features as soft clipping and out-of-phase operation of the power amplifiers for better power supply utilisation.

It is a very clever design teamed with a very good preamplifier. (The NAD combination was reviewed in *Electronics Australia* in the November 1985 issue.)

Receivers

Judging this category was much easier as there were only five entries: JVC R-X400, NAD 7155, Sharp SA-118HS (disqualified, see note above), Technics SAR-100 and Yamaha R-9B.

As with the JVC amplifier, the R-X400 is something of a technological tour-de-force, with far more features than any other in its category. Rated at 80 watts per channel, it too has a com-



The winning receiver entry was Yamaha's feature-laden R-9B.

puter controlled analyser equaliser with a very fancy multicoloured liquid crystal display which indicates virtually every facet of all the receiver's operating modes.

Its synthesised FM/AM tuner has no less than 15 presets for both AM and FM and it has inputs for both moving magnet and moving coil cartridges. Surprisingly, JVC entered the R-X400 in preference to the top-of-the-line model R-X500 which also offers the luxury of full remote control of all functions. Price of the R-X400 was $899.00.

The NAD 7155 is quite similar in features to the model 7140 which won its category in the inaugural awards. Indeed, its very similarity to the 7140 helped the judges to decide that it did not represent a major advance on the 7140 and therefore could be eliminated from the final contenders. Price of the NAD 7155 was $999.00 for a rated power output of 75 watts per channel into 8Ω loads.

Technincs' SAR-100 entry was a little out of the ordinary. It is a very compact music system which includes stereo cassette player with Dolby B and C Noise reduction. All functions are adjustable by the infrared remote control and the slimline styling of the system is complemented by the flat honeycomb loudspeakers. The whole ensemble is intended to be hung on a wall.

As such, it makes an attractive and compact system but the judges felt that its modest power output of 30 watts per channel meant that it could be used satisfactorily with only a limited range of loudspeakers, should the user wish to substitute for the honeycomb units, which are not an option. The SAR-100 was the dearest receiver entry, at $1459.00.

The fifth entry, the Yamaha R9B, must be one of the most feature-laden receivers available, regardless of price. Beautifully finished in sombre black, it has so many controls that half of them are concealed behind a wide, flip-down door. To list all the features would take up more space than we could spare but perhaps one feature is an indication of the thought that has gone into the design.

As with a number of top-of-the-line receivers, the Yamaha R-9B has an infrared remote control. But the R-9B has a conventional volume control with a LED-illuminated pointer which can be used just like a control on any amplifier. When you use the remote control, the volume control rotates by itself which is not only very snazzy but it gives an immediate and unmistakable indication of the volume setting.

Suffice to say that the Yamaha won the receiver category with very little debate from the judges. It is priced at $1399.00 and as with all Yamaha audio products, has a five-year warranty.

Best tuner

Eleven models were entered in this category, listed as follows:

Amber model 7	$ 995.00
Audiosound AM101	$ 649.00
JVC TX-900B	$ 729.00
NAD 4155	$ 539.00
Nakamichi ST7	$1250.00
Pioneer F-99X	$ 599.00
Sharp ST-207X	system $1299.00
Sansui TU-D99AMX	$ 899.00
Sony ST-S444ES-II	$ 549.00
Technics ST-G6T	$ 599.00
Yamaha T1020B	$ 499.00

Of the eleven tuners, only two offered the feature of AM stereo reception and only one of these is Australian made, by Audiosound Laboratories. Unfortunately, it is AM only and manually tuned, whereas all the other tuners under consideration are fully synthesized.

Of the others, the Sony model stood out as a particularly good performer at a relatively low price. It is also very well finished. It was reviewed in the December issue of *Electronics Australia.*

Other tuners which stood out as being good performers at a good price were the NAD 4155 with its "dynamic separation" circuit and the Pioneer with its very good ultimate signal-to-noise ratio.

Ultimately though, the judges felt that they could not ignore the fact that Australia now has AM stereo broadcasts and that only one of the tuners submitted met the twin criteria of good FM performance plus the capability to receive AM stereo. The model in question is the Sansui TU-D99AMX. Its FM specification is particularly good and its AM bandwidth is better than average. It was clearly the winner of its category.

Cassette decks

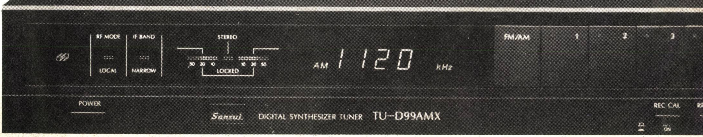
Aiwa ADWX 220	$ 787.00
Akai GX-9	$1049.00
JVC KC-V6	$ 679.00
NAD 6155	$ 549.00
Nakamichi BX-300	$ 999.00
Pioneer CT-A9X	$1499.00
Sharp RT-207XS	system $1299.00
Technics RS-B66W	$ 889.00
Toshiba PC-G16	$ 169.00
Toshiba PC-G46WR	$ 379.00
Yamaha K-1020	$ 899.00

Of all these machines, one model clearly stood out for popularity, performance, features, the lot . . . the Nakamichi BX-300. It was no contest at all.

Turntables

Ten products were submitted within this category, one being a phono cartridge:

Aiwa PX-E10	$ 239.00
Akai AM-A90	$ 949.00
Dual CS-5000	n.a.
Logic DM-101	$1295.00
Sharp RP-207X	system $1299.00
Shure Ultra 500	$1212.00
Sony PS-X555ES	$ 799.00
Systemdek IIX/Profile II Arm	$ 549.00



Thorens TD 320	$ 799.00
Yamaha PF-1000	$ 999.00

Two turntables stood out in the judges' minds: the Yamaha PF-1000 and the Thorens TD320. Both are fairly conventional in overall presentation although the Yamaha has a rather unusual twin-tube design which is claimed to be advantageous in damping out arm resonances. Both the turntables are belt-driven too although so are the Logic DM-101 and Systemdek.

The final clincher, as far as the Thorens was concerned, was its proven reputation for performance and reliability which has been carefully refined over many years from the original TD124 model. So Thorens won, which is sure to appeal to the traditionalists among hifi (and analog) enthusiasts.

The award-winning Thorens TD 320 has electronic speed selection and belt drive.

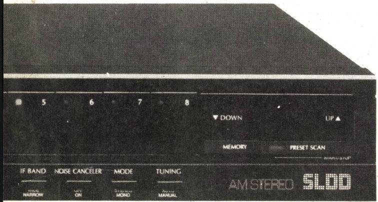
Compact disc players

In view of the over-riding interest in CD players and the very large number of models available, as indicated in the listing published in last month's issue, it is surprising that there were not a lot more entries in this category.

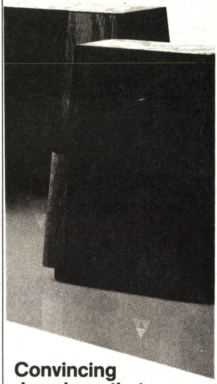
Eleven models were submitted:

Aiwa DX1500	$ 735.00
Akai CD-A7	$ 699.00
NAD 5255	$ 899.00
Nakamichi OMS-5	$1795.00
Nakamichi OMS-7	$2400.00
Pioneer PD-9010X	$ 999.00
Sharp DX-220H	$ 499.00
Sony CDP-502ES	$1349.00
Technics SL-P3	$ 839.00
Toshiba XR-V11	$ 479.00
Yamaha CD-3	$ 749.00

Five of the CD players have remote control, with the cheapest of these being the Yamaha CD-3. In view of Yamaha's record so far with CD players (Yamaha won last year, with the CD-X1), it was perhaps inevitable that it would be amongst the final contenders. The other two in the final few were the Sony CDP-502ES and the Nakamichi OMS-7. While the judges all agreed that the Yamaha was a good performer at a good price, the final decision was



Sansui's TU-D99AMX won the best tuner award and was the only one of two entries which featured AM stereo.



TRIAD™

Convincing deep bass that conventional small speakers can't deliver.

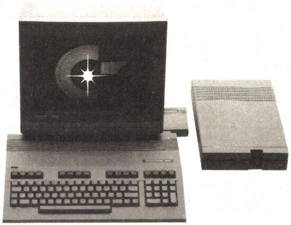
A basic fact of speaker design is the relationship of enclosure size and resonance. The smaller the enclosure, the higher the resonance — which determines the lower limit of bass response. There's no way around this. That is, no conventional way.

The Triad 70 gets around it with a revolutionary amplified woofer. The circuitry of this specially-designed built in 70 watt amplifier if proprietary. It has U.S. and international patents pending.

But we can reveal that this special powered woofer is able to operate well below its resonant frequency, and delivers bass response down to 24 Hz, flat within ± 3 dB. That's two full octaves below the limits of conventional small speakers. So with the Triad 70 you have deep bass plus superb imaging.

Sole Australian Distributor
Art! P.O. Box 58
Northcote 3070
Vic. (03) 419 0064

If you own an Apple IIc, you'd have to add all this



to match the versatility, expandability and higher intelligence of the new Commodore 128

(and it costs less too).

The new Commodore 128™ personal computer is breakthrough technology at a breakthrough price. It outshines the Apple® IIc in performance capability, performance quality and price. It is expandable to 512K RAM while the IIc isn't expandable at all. And the new Commodore 128 has a numeric keypad built right into its keyboard that makes crunching numbers a lot easier. And the Commodore 128 has graphic and sound capabilities that far exceed those of the Apple IIc. But the most important news is that the new Commodore 128 jumps you into a whole new world of business, productivity, education and word processing programs while still running over 3,000 programs designed for the Commodore 64.™ That's what we call a higher intelligence.

COMMODORE 128 A Higher Intelligence

commodore
COMPUTER
Keeping up with you.

BEEMAN MAYRHOFER STOTT/CC422

among the two top-of-the-liners, Sony and Nakamichi.

Both these machines are superbly finished and very thoughtfully designed. The Sony has one unique feature though: remote control of volume. Would that other CD players had this feature . . . it's a beauty. The judges also felt that the Sony had the edge in overall performance over the Nakamichi and that, at a good $1000 under the price of the OMS-7, the Sony was a clear winner.

Loudspeakers

Eleven loudspeakers were up for judging, listed as follows:

Audiosound 8035	$1060.00
B&W Active I	$4750.00
B&W 808	$8600.00
DCM Time Window 3	$3600.00
KEF GT-200	$ 999.00
NAD 20	$ 799.00
Pioneer DSS-9	$1599.00
Sony APM-22ES	$ 769.00
Technics SBR 100	$ 479.00
Triad 70	$1295.00
Yamaha NS-1000x	$3599.00

That is quite a line-up with some very expensive loudspeakers present. Both the B&W models are regarded as superb performers, the Active 1 being especially so. It is essentially a complete music system, needing only the sources such as turntable, tuner and compact disc to be connected to its control unit.

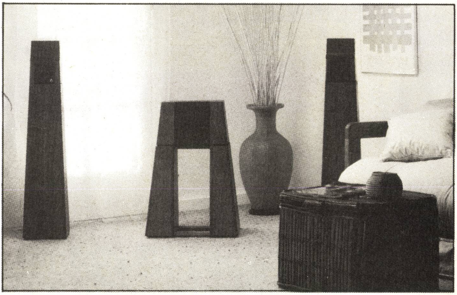
Each loudspeaker enclosure is a three-way system, especially equalised and driven by a 200W amplifier for the bass and midrange units while the tweeter is driven by its own 100W amplifier. Both amplifiers are Mosfet-powered and have very low distortion, typically below .003%.

The Yamaha NS-1000x also has a very high reputation, being regarded as one of the best loudspeakers ever to come out of Japan and a great speaker in its own right. Essentially, it is a refinement of the already refined NS1000m which has been around for some time. The NS1000x is a three-way system with the ultralight beryllium tweeter and midrange drivers of the NS-1000m plus the new carbon fibre woofer of the NS-2000 model. In addition, the front corners of the cabinet have been smoothly rounded to minimise high frequency diffraction effects.

Time Windows

Within a dollar of the Yamaha loudspeakers are the DCM Time Windows. They employ a folded transmission line enclosure for bass loading of the two bass/midrange drivers and have a 19mm soft dome tweeter which is ferro-fluid cooled for high power handling. They are claimed to have exceptional stereo imaging and to be quite non-critical of room placement and listening position.

The maverick entry in the loudspeaker category was the Kef GT200 loudspeakers. These are a highly innovative design drawing on the research background for the award-winning Kef 104.2 loudspeakers. They are most effective in producing a lot of bass in a car but the judges felt that they really did not fit into this category. Had there been an award for car sound equipment, the GT-200s would have been strong contenders.



Pictured above is the the Triad 70 satellite loudspeaker system, shown with optional stands.

Another innovative design was the Sony APM-22ES. This bass reflex system uses a square and flat aluminium honeycomb woofer driven at four "sweet spots" from a common voice coil. The tweeter is also flat and square although just how this improves on a conventional dome tweeter Sony have not explained. The cabinet is another of the systems that have rounded front corners to reduce diffraction effects.

The decision on the winner amounted to a piece of lateral thinking by the judges. This awarded the prize to the little-known Triad 70 system. This is a satellite design, with two very compact two-way enclosures complemented by an almost as compact sub-woofer enclosure with its own inbuilt 70W power amplifier. These have very good sound quality, are affordable by a reasonable proportion of the populace and can be used in so many of today's smaller homes and home units.

Technological development

This category tended to be a grab-bag of entries of all sorts of equipment some of which, in the judges' opinions, were a bit of a joke, hardly being innovative at all. Readers can judge for themselves whether or not all of them were worthy.

The list of entries is as follows:

Aiwa CTX-500 cassette deck; dbx Soundfield loudspeakers; Jecklin "float" stereo headphones; JVC Crossmedia audio/video systems; Polk SDA CRS loudspeakers; Monster Cable Powerline 3; Sharp QT-94Z double cassette music system; Sony D-50 portable CD player; Technics SH 8066 graphic equaliser/analyser; Yamaha C2X preamplifier/B2X power amplifier.

All right, there were some innovative products of note in there, such as the dbx Soundfield speakers (reviewed in the March 1985 issue of EA), the Jecklin headphones and a couple of others. But there is one product which stands out like a beacon as far as technological development is concerned, the Sony D-50 portable CD player. Fair dinkum now, could it have been any other? The judges did not debate it at all.

Who were the judges? They were Greg Borrowman, editor of *Australian Hifi,* David Frith, audio and video writer for *The Sydney Morning Herald* and Leo Simpson, editor of *Electronics Australia*.

Letters to the editor

Star Wars is not the answer

While the daily papers may be a better forum to debate 'Star Wars', R.J. Long's (Dec. 1985) enthusiasm for a cheap, effective and low technology missile defence system must be tempered by reality. The scenario of 10,000 warheads being 'torn to pieces' would be an environmental disaster second only to 10,000 nuclear detonations.

Among the debris raining to earth would be one hundred tonnes of plutonium 239 from the trigger devices (10kg per warhead). Plutonium 239, with a half-life of 24,400 years, is our most toxic substance.

There is no 'safe' dose, with either an early death from the radiation, or from cancer, some years later. It is neither biodegradable nor chemically inactivated. It can only be safe when totally isolated from the environment.

In the year 26,400 AD, our children, one thousand generations from the fathers of the atomic age, will still be dying from the effects of the 50 tonnes of this plutonium, still unchanged from the day we first manufactured it in our military and power reactors.

If we cannot have nuclear-free peace, then Armageddon may be preferable.

R.A. Vickers,
Mt. Waverley, Vic.

Reviewers: a vote of thanks

A vote of thanks to your anonymous band of reviewers.

They too contribute to the final judgement by the reader of the quality of EA, but may be overlooked by editor and reader alike in the quest for the latest and greatest in electronics.

This year I enrolled in a 3rd year electrical maths course but this "serious hobbyist" soon found himself deficient in circuit theory.

The review of 'Electric Circuits, Theory and Engineering Applications' by Durney et. al. (EA, July 1985), by describing the author's approach to the topic, as well as detailing the contents of the book and assessing the audience most suited, enabled this reader to decide it was tailor-made for his situation.

I thank these reviewers and remind the editorial staff of their contribution to the totality of EA.

D. Larkin,
Donnybrook, WA.

● *Thanks for your letter. Actually, the book reviews are written by EA staff members. The initials of the reviewer appear at the end of each review.*

How many million in one billion?

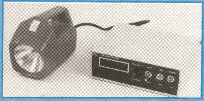
I refer to your use of the word "billion". As no doubt you know, the English (and Australian) "billion" is 10^{12} or a bi-million, whereas the American (and French) billion is 10^9. One notices that the Commonwealth Bank, the Prime Minister and Treasury also use the word "billion" and this makes it impossible to determine which one is meant.

In the October edition of EA it is found at least twice (pages 7 and 17). I suggest that in a technical magazine, indices should be used to save confusion. After all, on page eight of the same magazine 11 x 20^{-18} occurred, leaving no room for confusion.

D. Lunck,
Clermont, Qld.

Next month in Electronics Australia

Digital Strobe



Covering the range from two to 200 flashes per second, this adjustable stroboscope is just the shot for measuring motor speed. It features a 4-digit LED readout and can be switched to display either revs per second or revs per minute.

100W VHF Amplifier

Here at last is a VHF linear amplifier that's easy to build. It features an output power of 100W and can be used with typical 10-15W transceivers such as the Dick Smith Commander published in June and July 1984.

Special Feature on AM Stereo

Interested in AM stereo for your car or lounge room? This special article looks at the equipment available and gives a complete listing of current stereo AM and FM radio stations.

CD Adaptor for Cars

How do you connect a portable compact disc player to your car sound system? With our CD Adaptor, of course. It's a simple circuit and easy to build. (Note: held over from last month.)

Note: Although these articles have been prepared for publication, circumstances may change the final content.

Editorial Viewpoint

by Leo Simpson

We've seen the last of cheap hifi!

During the preparation of this month's article on the second Australia hifi awards, one point became increasingly clear. Good hifi equipment is becoming increasingly expensive. This is in contrast to video cassette recorders which are now very cheap. At the time of writing this editorial, it was possible to buy a number of VHS machines at well under $500 and at least one Beta machine for less than $400, thought Beta machines are becoming quite scarce in the shops now.

Even the newer hifi VCRs have tended to steadily fall in price, or at least, not rise to reflect the falling value of the Australian dollar.

When compared with VCRs, hifi equipment is very dear. This is especially so when you compare the mechanical and electronic complexity of video machines with the relative simplicity of a stereo amplifier or even a fully synthesised AM/FM stereo receiver. For example, compare the prices of any of the 100W-plus amplifiers or receivers on page 8 and page 10 of this issue. Admittedly, these are mostly top-of-the-range models but they are dear, nonetheless. By contrast, the top performing Playmaster Series 200 amplifier is a real bargain.

Interestingly, the most complex piece of hifi equipment, the compact disc player, is steadily becoming cheaper in real terms.

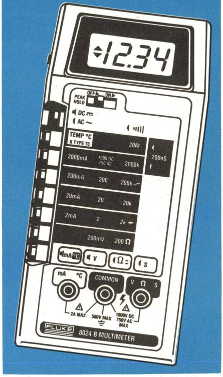
Perhaps the main reason why VCRs and CD players are becoming cheaper is that they are being made in very large quantities whereas the production runs for hifi equipment are generally much smaller. There is also a certain amount of marketing "strategy" in the price of the esoteric hifi equipment but the general trend in prices is upward.

Of course, rack systems are still fairly cheap but unless you are thinking in terms of a system costing $1500 or more their performance is likely to be compromised, particularly as far as the loudspeakers are concerned. Loudspeakers, with their relatively high labour content, are the dearest hifi components of the lot and even quite modest two-way systems can now cost well in excess of $1000.

Luckily though, hifi equipment is still a buyers' market to some extent, so distributors and dealers will have to keep the lid on prices as much as possible to keep sales going. People who build their own amplifiers and loudspeakers will also have more incentive now, as they will be able to save even more money by working at their hobby.

Whatever happens, the era of cheap hifi equipment seems to have well and truly passed.

FLUKE GREYLINE DIGITAL MULTIMETERS WITH EXTRA FEATURES



8024B
- 3-1/2 digit
- 0.1% basic accuracy
- 11 functions including temperature with type K thermocouples
- Peak hold on voltage and current
- Logic detection and continuity testing
- Audible and visible indicators

8060A
- 4-1/2 digit
- 0.05% basic accuracy
- True rms to 100kHz
- Frequency counter to 200kHz
- dB and relative dB
- Microprocessor self diagnostics

8026B
- 3-1/2 digit
- 0.1% basic accuracy
- True rms to 10kHz
- Conductance to 10,000 Meg
- Diode test and continuity beeper

8062A
- 4-1/2 digit
- 0.05% basic accuracy
- Relative reference
- True rms to 30kHz

FROM THE WORLD LEADER IN DIGITAL MULTIMETERS.

FLUKE ®

See the Fluke Greyline series at leading electronics stores or contact us for data

ELMEASCO Instruments Pty. Ltd.

NEW SOUTH WALES
15 McDonald Street,
MORTLAKE
P.O. Box 30, CONCORD
NSW 2137
Tel: (02) 736 2888
Telex: AA25887

VICTORIA
12 Maroondah Highway,
RINGWOOD
P.O. Box 623, RINGWOOD
VIC 3134
Tel: (03) 879 2322
Telex: AA30418 ELTENT

QUEENSLAND
Tel: (07) 369 8688
S AUSTRALIA
Tel: (08) 344 9000
W AUSTRALIA
Tel: (09) 481 1500

SOUND and

Before attempting to discuss at length the subject of high fidelity sound reproduction, it may be helpful to set out some basic facts about the nature of sound itself, the means by which we hear it and factors which determine whether or not we find the experience to our liking. So let's start right there.

Without resorting to the formality of a dictionary, sound may be defined broadly as anything that can be heard, whether it be in the form of noise, speech, music, or whatever.

Not everyone can hear every sound in a given environment because some sounds are so soft that, for certain people, they lie below their so-called "threshold of hearing". Again, other sounds may be too high-pitched for some people's ears to sense.

In the normal way, sound is created when a vibrating mechanical body or other such disturbance produces a sequence of rapidly recurrent variations in air pressure in its immediate vicinity. The variations radiate outwards from the source, through the surrounding air in the form of sound pressure waves, much like ripples in a pond.

On reaching a person's ears, the recurrent pressure waves are sensed by means we shall examine a little later. Transformed into neural (nerve) impluses, they then pass to the brain, where they are interpreted as "information" of one kind or another: noise, speech, &c.

Fig.1 illustrates the simplest, purest tone that can be presented to the human ear — a "sine" wave, so called because it has a mathematical basis. Sine waves, or something very similar to them, are produced by electronic organs and music synthesisers and are employed in audio test equipment.

Some traditional music sounds, and the associated air pressure variations, are relatively simple, for example, single notes from a solo flute; others are extremely complex, like those from an orchestra, a concert organ or a large choir.

The amazing thing is that, simple or complex, the human brain is able to sort out pressure variations sensed by the ear and translate them into something we can relate to or, alternatively, ignore!

How many times have you been absorbed in a book and apparently not heard sound that must clearly have reached your ears? Or conversely, been asleep and ostensibly unaware of any sound — except one that your "sleeping brain" considered important enough to let through?

Sound pressure level

Sound pressure level (SPL) can be expressed in microbars, reminiscent of the millibars used to specify atmospheric pressure in weather reports. In the context of audio-hifi, however, sound pressure level is commonly expressed nowadays in dynes/sq.cm, a unit that is quantitatively equivalent to the microbar.

The smallest sound pressure level that can be sensed by young, healthy human ears — the so-called threshold of human hearing — is about 0.0002 microbar. By comparison, a person talking generates a sound pressure level of around 1 to 2 microbars, at a distance of 1 metre, and up to 10 microbars when shouting.

Typical human ears can cope with sound pressure levels up to about 200 microbars without obvious aural overload. At pressures approaching and beyond 2000 microbars, however, sounds become physically painful and may damage the hearing with prolonged exposure.

Many old-time boilermarkers learned this the hard way!

Meet the decibel

While the foregoing figures are informative, they are also rather clumsy and they take no account of one very important fact: that the ear varies its sensitivity automatically as the prevailing level of sound rises or falls. It transpires that the loudness of sound, as perceived, varies approximately as the logarithm of the change in acoustic power level.

It is because of this characteristic that the ear can cope with such an enormous range of sound pressure levels — from the barely audible hum of a mosquito in a quiet room to the massive roar of a jetplane at take-off.

WAVES... how we hear them

by NEVILLE WILLIAMS

The "decibel", a logarithmically based unit, was adopted many years ago by the audio-acoustics industry, as a more eloquent way to express relative power levels, especially as they affect people needing to quantify original or reproduced sound on an everyday basis.

A power ratio can be converted to decibles (dB) by determining the log (to the base 10) of the particular ratio, multiplying it by 10 and calling the result decibels (dB).

Since the acoustic power of a sound varies as the square of the sound pressure level, the log of the pressure ratio has to be multiplied by 20, rather than by 10. A pressure ratio of 10:1 works out at 20dB, 100:1 at 40dB, 1000:1 at 60dB and so on.

Research has shown that the smallest change in sound pressure level (SPL) that human ears can easily detect is about 3dB, equal to a power ratio of 2:1. It may come as a surprise to realise that doubling the acoustic power of a sound, or the available power output from an amplifier, makes only a marginal difference to the perceived loudness!

Decibel notation was subsequently adapted by the industry to express absolute sound pressure levels, as distinct from mere ratios, by arbitrarily referencing 0dB to the nominal threshold of hearing at 0.0002 microbar.

This provides the basis for Table 1, and many others like it, showing 0dB as the threshold of hearing, 40dB as the ambient sound level in a typical living room, 60dB as an average conversational level and 140dB as the pain threshold.

Amplitude, frequency

The magnitude of the upward/downward excursions in instantaneous pressure is referred to as the "amplitude" of a sound wave — miniscule for tiny sounds, just the reverse for jet planes. Fig.1b depicts the peak-to-peak amplitude of a sound pressure wave, and the RMS value on which the acoustic power is based.

(Amplitude is a term that is encountered frequently in audio/hifi literature, being used to describe the magnitude of signals passing through an audio amplifer, the physical movement of loudspeaker cones and so on.)

Sound waves travel through normal atmosphere at about 335 metres (1100ft) per second, much slower than radio waves (or light waves) at around 300,000km/s.

For a sine wave or a simple tone propagating through air, a complete pressure excursion from normal to maximum, then through to minimum and back to normal is referred to as one "cycle" (Fig.1b).

The number of complete cycles passing a given point in space in one second is described as the "frequency" of the signal.

Audio frequencies were originally specified in cycles per second (c/s) or kilocycles per second (kc/s). In honour of the pioneer German physicist, Heinrich Hertz (1857-1894) c/s was subsequently replaced by the term "Hertz" (Hz) along with its decimal multipliers, kHz, MHz, &c.

The distance between adjacent pressure peaks is defined as the "wavelength" (Fig.1a). Without dwelling on the matter here, the wavelength of sound energy has an important bearing on its behaviour in a domestic hifi situation, especially in regard to loudspeakers and listening room dimensions.

Sense of hearing

So much for the nature of sound. Before pursuing it further into the everyday world of music, speech and noise, let's take a closer look at human hearing — undoubtedly a most discriminating faculty.

At its best, the ear can cope with a tremendous range of sound pressures, and sense frequencies from about 15Hz to almost 20kHz. It can readily pick the difference between various instruments playing the same note and sort out the instrumental sounds in a complete orchestra. It can detect changes in pitch of 1 part in 1000, and nominate the direction from which sounds are coming.

A blindfolded person can even form a judgment of an acoustic environment by spontaneously sensing the direction and time delay of echoes.

While human hearing certainly does deteriorate with age and as a result of illness, it nevertheless justifies the considerable effort put into the initial creation of good music and the provision of

Sound Pressure microbars	Typical Sound	Loudness Level decibels
2000	pain threshold	140
200	jet aircraft	120
20	subway	100
2	orchestra	80
0.2	conversation	60
0.02	quiet room	40
0.002	rustling leaves	20
0.002	hearing threshold	0

Table 1: Typical listening situations listed against measured sound pressure levels (left) in microbars, and subjective loudness level (right) expressed in decibels.

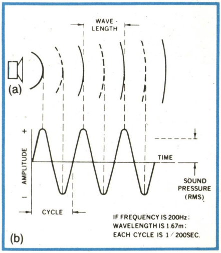

WAVE-LENGTH
(a)
+
AMPLITUDE
−
TIME
SOUND PRESSURE (RMS)
CYCLE
IF FREQUENCY IS 200Hz: WAVELENGTH IS 1.67m: EACH CYCLE IS 1/200SEC.
(b)

Fig. 1: Depicting a sine wave (b) as radiated from a loudspeaker (a). The diagram illustrates various parameters mentioned in the text: cycle, wavelength, frequency, amplitude and sound pressure level.

Sound waves–how we hear them

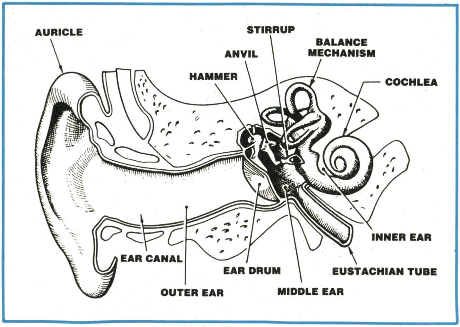


Fig. 2: The human ear comprises three main sections: (1) the outer ear — auricle, ear canal and drum; (2) middle ear — three tiny bones which control the sound vibrations on their way to (3) the inner ear or cochlea — virtually nature's "microphone". Note that the inner ear is also involved in maintaining our sense of balance.

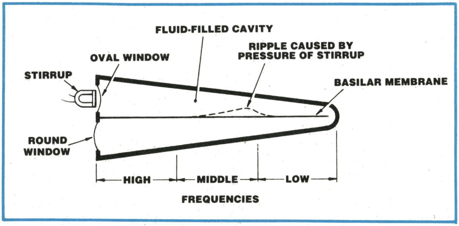


Fig. 3: A highly simplified illustration of the cochlea. Sound vibrations originating through the oval window set up pressure waves in the cochlea fluid, causing "standing wave" ripples or oscillations to be set up in the basilar membrane. Their position is frequency dependent and is sensed by a complex of nerves.

equipment able to record and reproduce it faithfully.

The human ear

The human ear comprises three distinct sections: the outer ear, middle ear and inner ear. The outer ear involves the visible fleshy part, called the auricle or pinna, plus the ear canal and ear drum, as illustrated in Fig.2.

Recent work has confirmed that the auricle or pinna are not just random adornments or nature's fortuitous provision for supporting spectacles! They modify the incoming sound waves in a way which contributes significantly to the ability of the ear to sense direction.

The ear canal is a fleshy tube, open at one end, which functions vaguely like an organ pipe, in exhibiting a modest degree of resonance. It favours incoming sound waves in the region between about 2000 and 5000Hz, tending to increase acuity in the important upper-mid frequency range.

At the inner end of the ear canal is a tough, flexible membrane called the ear drum, which seals and separates the outer ear from the middle ear.

The middle ear

The ear drum vibrates in sympathy with the air column in the ear canal and transfers the vibrations to three tiny bones in the middle ear. Called the hammer, anvil and stirrup (or stapes) the three bones form a lever system which passes the vibrations on to the inner ear, at the same time providing a measure of impedance matching between the two.

A system of involuntary muscles controlled from the inner ear acts as a form of automatic volume control to protect this delicate system from damage. When excessively loud sounds are encountered, the muscles readjust the position of the bones slightly and tighten the ear

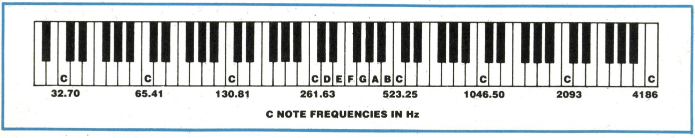


Fig. 4: If you are uncertain about the relationship between frequencies in Hertz and the actual pitch of musical notes, this diagram should help. For standard concert pitch, middle-C has a frequency of 261.631Hz. Note that the frequency of each semitone increases by a factor of about 1.06.

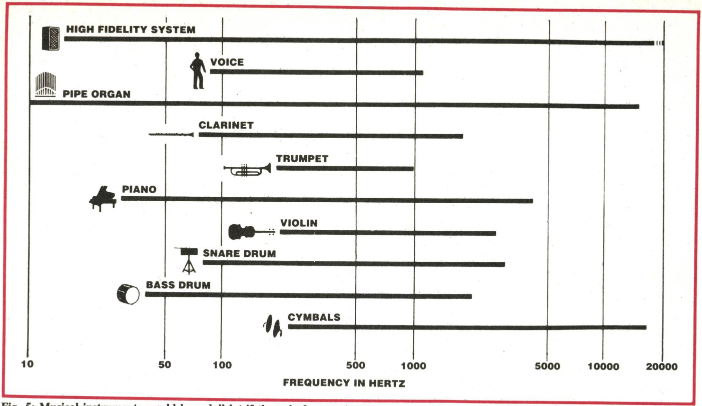


Fig. 5: Musical instruments would be a dull lot if the only frequencies they could produce were within the confines of their formal music range. In fact, their sound is enriched by an array of harmonics, plus other subtle non-harmonic sounds.

drum so that less of the vibration energy gets through to the inner ear.

While the provision is effective in most ordinary situations, it does little to protect the ear against continued long-term exposure to excessive noise levels, or against sudden, explosive blasts of sound.

One other point should be made here, which will be better appreciated as we get further into the series: the automatic volume control function of the ear appears to operate at a sub-audio rate. Thus, while it can adjust the sensitivity to accommodate a variety of prevailing sound levels, the logarithmic control characteristic does not greatly affect the shape of individual audio waveforms.

It therefore does not produce gross aural distortion, as is sometimes suggested. In this respect, the control characteristic of the ear finds a parallel in a variety of variable gain electronic circuits.

The inner ear

As illustrated in Fig.3, sound vibrations are transferred by the stirrup of the middle ear to what is effectively a second diaphragm — the so-called "oval window" of the fluid-filled cochlea.

To-and-fro vibration of the oval window causes waves of fluid pressure to sweep the length of the snail-shaped cochlea, creating "standing wave" ripples in the (basilar) membrane. These, in turn, are sensed by an intricate system of nerves.

Ripples occur at different points along the membrane, depending on the frequency of the incoming sound wave(s) and only nerves which are near the crest are stimulated, thus accounting for the ear's ability to sense frequency.

The inner ear is the "microphone" of the hearing mechanism, in the sense that it converts sound vibrations into neural signals. There the comparison lapses, however, because nerves by their very nature deal in pulse-type information rather than a smooth, electrical replica or analog of the sound envelope.

The fact that the brain can interpret a pattern of sound as complex as that from a full symphony orchestra, plus a choir and/or a grand organ, becomes all the more amazing when it is realised that, in the process, the information has been neurologically pulse-encoded and decoded!

A subjective skill

Most people are born with the potential to hear and interpret sound but the actual ability to do so has to be learned by experience, from birth. Like any other learning process, it is subject to a variety of factors, both physical and environmental.

As already suggested, some people's ears are able to sense a wider range of frequencies than others, but the ability can be curtailed by age, physical ailments, or prolonged exposure to excessive levels of sound — a hazard that has been historically greater for men than women.

To complicate matters further, hearing loss can affect one ear more than the other, causing a degree of unbalance which the brain may not be able to compensate. When this occurs, the ability to sense the direction of sound is impaired, along with the facility to concentrate on a particular sound in a noisy environment. It becomes more difficult, for example, to follow a conversation in a crowded room.

People differ also in their ability to tolerate high levels of sound, with the advantage, this time, appearing to favour men. Certainly, most complaints about music being excessively loud, to the point of physical distress, seem to come from women.

But men and women alike tend to condemn most readily, as too loud, sound which they happen not to like, indicating something other than a purely physical reaction.

Certainly, the "loudness" of speech or

music or noise, as perceived by individuals, is a subjective judgment and needs to be distinguished from the sound pressure level as measured on instruments. The two are interrelated but they are not the same.

Again, ears appear to vary in the "quality" of the signal which they pass on to the brain. Musical tones which are accepted as normal by some, are judged to be harsh or "distorted" by others.

Musical "pitch" is yet another subjective area, as distinct from the measured frequency of a particular musical note. People with a highly developed sense of pitch may argue that, frequency notwithstanding, a certain note sounds "off pitch". Their judgment, it would seem, is influenced by other factors such as the relative loudness and tonal quality of the sound.

It is often unclear, in such matters, whether opinions are based on physiological differences or acquired skills, or both, but one thing is certain: Our reaction to sound is individual and subjective; we each hear things a little differently from our neighbour — a fact which undoubtedly enlivens debate about audio-hifi topics!

And so to music:

It was stated earlier that young, healthy human ears can typically sense frequencies from about 15Hz to just under 20kHz. To convey some idea of what various frequencies sound like, Fig.4 shows the frequency of various C notes on a piano (or on an organ using what is described as an "8ft" voice).

Fig.5 depicts the nominal frequency range of various well known instruments, and here a word of explanation:

If the frequency scale along the bottom of the diagram looks strange, it is because it conforms to the normal practice of plotting audio frequencies on a logarithmic scale. It opens up the important bass region and puts the middle or voice frequencies in the centre, without unduly crowding the treble end.

For instruments which produce discrete musical notes (e.g. organ, clarinet, trumpet, piano & violin) the frequency range depicted in Fig.5 refers purely to what is known as the "fundamental" or "first harmonic", or the basic musical pitch of the physically available notes. Those on the piano keyboard cover a freqency range from just under 30Hz to something over 4000Hz (or 4kHz).

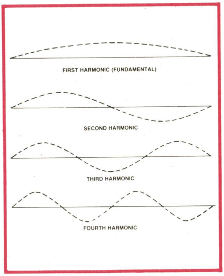


Fig. 6: Illustrating typical vibration modes of an instrumental string. Only harmonics 1-4 are shown but there can be many more.

Harmonic modes

There is more to it, however. When strings are struck (as in a piano), plucked (as in a guitar) or otherwise excited (as in the violin family) they tend to vibrate in a quite complex manner, as illustrated in Fig.6.

In the fundamental (or first harmonic) mode, the string vibrates or oscillates as a whole with respect to the two fixed ends — this at a frequency determined mainly by its physical mass and the tension to which it is subjected. In so doing, strings generate sound waves at the fundamental frequency: 261.63Hz in the case of middle-C.

But there is also a tendency for the two halves to oscillate simultaneously around the centre point, producing a "second harmonic" at about twice the frequency of the fundamental note. A third and fourth harmonic mode is also illustrated in Fig.6 but, in practice, harmonic modes may extend to at least the eleventh.

It follows that, while the nominal frequency of middle-C is 261.63Hz, the accompanying harmonics may range up to around 3000Hz. For notes higher up on the piano keyboard, they may extend up to and beyond the limit of human hearing.

What is true of strings is also true, in general, of instruments relying on a resonant column of air (pipe organ, flute, &c), resonant plates or tubes (xylophone, &c), resonant reeds (accordion), or reed-excited air columns. All produce harmonics in addition to the first, and therefore frequencies well beyond the limits of their nominal pitch range.

Over and above regular harmonics, many instruments are characterised by subtle non-harmonic noises of their own: the air noise of a pipe organ or flute; the thud of hammers or the click of plectra; the buzz of reeds; the scrape of bows — noises which can be acceptable or objectionable, depending on the merits of the instrument and the player.

Memorised, over the years, these harmonics and sounds provide the basis on which we recognise the various instruments — along with members of the percussion family: the bass drum, the timpani, snare drum, cymbals, triangle and the rest.

Wave "envelope"

Out of all this, certain puzzling but quite legitimate questions may occur to the reader:

Considering just one typical note from one typical instrument, with a dozen different frequencies present, plus those

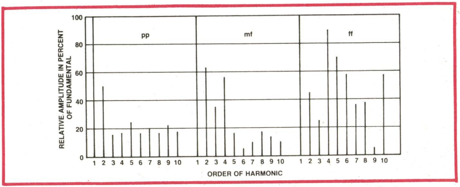


Fig.7: Harmonic analysis of middle C played on a piano at three loudness levels.

"subtle non-harmonic noises" . . .

How can one's ear drum follow a dozen or more frequencies simultaneously? How can it be doing a dozen or more things at the one time? And how can it possibly respond to fifty-dozen frequencies simultaneously from an orchestra or a choir?

The short answer is that ear drums cannot follow a multitude of frequencies simultaneously, or be moving in several different directions at once. Nor do they need to — fortunately!

While an instrument may indeed be producing many frequencies simultaneously, at any given instant, at a single point in space, the individual sound pressure waves can only add up to a single pressure resultant.

At the next instant — and the next — the resultant may be static, or increasing or decreasing; it can't be doing more than one thing at one time. So, if your ear drum happens to be at that reference point, it will simply be responding to the instantaneous resultant — frequently described as the sound pressure "envelope".

Fig.8 shows typical sound pressure resultants or "envelopes" from a violin, trumpet and clarinet, plus one from random noise. The amazing fact is that, if presented with such a sound envelope, the human brain can discern the component frequencies and identify them with a particular instrument; or as just plain noise!

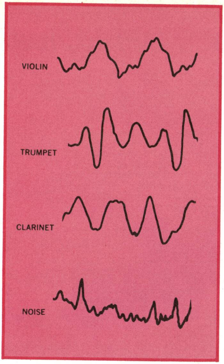


Fig. 8: Typical waveforms that might be presented to the ear, either directly or from a loudspeaker. Although just a scrawl to the eye, they can be resolved by our hearing into frequency components characteristic of the source.

And even if the envelope is that instantaneous pressure resultant from a complete symphony orchestra, with or without an associated choir or orchestra, plus building reverberation, the brain can still sort it out!

Fortunately, for the audio-hifi industry, the introduction of a recording and amplifier chain does not upset things. The microphones translate a pressure envelope into an electrical envelope or resultant, which is then recorded, reproduced, amplified and transformed back into a pressure envelope by the loudspeakers.

If the shape of the sound pressure envelope survives the procedure without being unduly degraded, we can enjoy performances by the greatest artists and the greatest orchestras in the world — some of them no longer with us.

But, for that to be the case, it is essential that the entire recording, reproducing and amplifying chain be as near to perfect as technology and finances will allow. And, really, that's what high fidelity is all about!

OUTSTANDING PERFORMANCE
... at safer temperatures!

Choose an approved soldering iron that best suits your needs.

☐ **Adcola 'Standard':** for hobbyists and general soldering.
☐ **Royel 'Duotemp':** push-button temperature control.
☐ **Royel 'Thermatic':** electronic feedback temperature control.
- Light weight, cool handles.
- No transformer required, plug in to 240V.
- Correct heat for Printed Wiring Boards.
- Many tip profiles available for all models.

ADCOLA ROYEL provides protection against thermal damage to modern circuitry.

ASK YOUR NEAREST ELECTRONICS PARTS SUPPLIER!

Chosen by AUSTRALIAN MILITARY SERVICES & LEADING MANUFACTURERS WORLDWIDE!

MHL 3035R

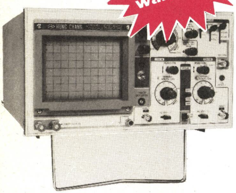
VIC: (03) 543 5122 ■ N.S.W: (02) 709 5293 ■ QLD: (07) 277 4311 ■ S.A: (08) 212 5999 ■ W.A: (09) 381 5500 ■ TAS: (002) 34 2233

Check our test equipment range!

Suitable for schools, OEM's, manufacturers, etc.

Includes two free probes!

12 months warranty!



Resistor

Zenon Diode

Digital Circuit

Capacitor

HUNG CHANG 20 MHz DUAL TRACE OSCILLOSCOPE (RITRON)

- **Wide bandwidth and high sensitivity**
- **Internal graticule rectangular bright CRT**
- **Built in component tester**
- **Front panel trace rotater**
- **TV video sync filter**
- **Z axis (Intensity modulation)**
- **High sensitivity X-Y mode**
- **Very low power consumption**
- **Regulated power supply circuit**

COMPONENT TESTER is the special circuit with which a single component or components in circuit can be easily tested. The display shows faults of components, size of a component value, and characteristics of components. This feature is ideal to troubleshoot solid state circuits and components with no circuit power. Testing signal (AC Max 2 mA) is supplied from the COMPONENT TEST IN terminal and the result of the test is fed back to the scope through the same test lead wire at the same time.

CRT

CRT: 6" (150mm) Flat-faced high brightness CRT with Internal Graticule.
Effective display area: 8 x 10 div (1 div = 10 mm)
Acceleration potential: 2KV

VERTICAL

Operating Modes: CH-A, CH-B, DUAL, ADD (CH-B can be inverted.)
Dual modes: Alter; 0.2ufs - 0.5ms/div. Chop; 1ms - 0.5s/div.
CHOP frequency 200KHz approximately.
Deflection factor: 5mV/div 20V/div +/−3%, 12 ranges in 1-2-5 step with fine control.
Bandwidth: DC; DC - 20MHz (−3dB). AC; 10Hz - 20MHz −3dB).
Rise Time: Less than 17ns.
Overshoot: Less than 3%.
Input Impedance: 1M ohm +/−5%, 20pF +/−3pF
Maximum Input Voltage: 600Vp-p or 300V (DC+AC Peak).
Channel Isolation: Better than 60 dB at 1KHz.

HORIZONTAL

Sweep Modes: NORMAL, and AUTO
Time Base: 0.2ufs - 0.5s/div +/−3%. 20 ranges in 1-2-5 step with fine control.
Sweep Magnifier: 5 times (5X MAG).
Linearity: 3%.

TRIGGERING

Sensitivity: INTERNAL: 1 div or better for 20Hz - 20MHz (Triggerable to more than 30MHz). EXTERNAL: 1Vp-p or better for DC - 20MHz (Triggerable to more than 30MHz).
Source: INT, CH-A, CH-B, LINE and EXT.
Slope: Positive and Negative, continuosly variable with level control PULL AUTO for free-run.
Coupling:AC, HF-REJ and TV. TV SYNC Vertical and Horizontal Sync Separator Circuitry allows any portion of complex TV video waveform to be synchronized and expanded for viewing TV-H (Line) and TV-V (Frame) are switched automatically by SWEEP TIME/DIV switch.
TV-V:0.5s/div to 0.1ms/div. TV-H:50ufs/div to 0.2ufs/div.

X-Y OPERATIONS

X-Y Operations: CH-A: Y axis. CH-B: X axis Highest Sensitivity: 5mV/div.

COMPONENT TESTER

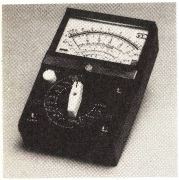
Component Tester: Max AC 9V at the terminal with no load. Max current 2mA when the terminal is shorted. (Internal resistance is 4.7K ohm)

OTHER SPECIFICATIONS

Intensity Modulation: TTL LEVEL (3Vp-p); Positive ...... brighter.
BANDWIDTH; DC - 1MHz MAXIMUM INPUT VOLTAGE: 50V (DC+AC Peak)
Calibration Voltage: 0.5Vp-p +/−5%, 1KHz +/−5% Square wave.
Trace Rotation: Electrically adjustable on the front panel.
Power Requirements: AC; 100, 120, 220, 240V 20W
Weight: 7kg approximately.
Size: 162(H) x 294(W) x 352(D)mm.

Cat. Q12105 .... **only $695**
(tax exempt only $595)

Bulk orders, schools, please phone (03) 543 2166 for special low pricing.



ANALOG WORKHORSE KT370

FEATURES:

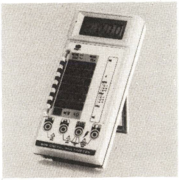
- Fuse and diode protection
- hFE measurements 0 - 1000 (by x 10 range)
- Mirror scale for more accurate reading

SPECIFICATIONS

Ranges:
DC Voltage: 0 – 0.1, 0.5, 2.5, 10, 50, 250, 1000V (20k ohm/V)
AC Voltage: 0– 10, 50, 250, 500V, 1000V (8k ohm/V)
DC Current: 0– 0.05, (50uA), 2.5, 25, 250mA
Resistance: 0– 2K, 20K, 2M, 20M ohm
Load Current: 0– 150uA, 15mA, 150mA
Load Voltage: 0– 3V
Volume Level: – 10 –+ 22dB –+ 62dB
DC Current Amplification Factor (hFE) 0– 1000
ACCURACY
DC Voltage & Current: Within +/–3% f.s.
AC Voltage: Within +/–4% f.s.
Resistance: Within +/–3% of arc.
Battery: 1.5V (um-3) 2pcs. 9V (oo6p) 1pc.
Fuse: 0.5A, 5ø x 20mm
Diode: 4148 x 2
C.C. .04uff x 50V
Size & Weight: 147 x 99x 57mm & 400g approx.
"The same type as I have carried in my toolbox since I started in electronics 15 years ago."

- Rod Irving

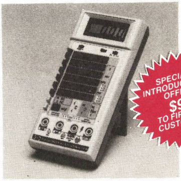
Cat. Q11030 .... **$27.95**



605 3½ DIGIT MULTIMETER

(New replacement for YF1100)

Cat. Q11025 .... **$79.95**



SPECIAL INTRODUCTORY OFFER $99 TO FIRST 100 CUSTOMERS!

705A 3½ DIGIT MULTI/CAPACITANCE METER

Cat. Q **$119**

605 & 705A SPECIFICATIONS

DC Voltage

Range	Resolution	Accuracy		Input impedance	Overload Protection
		605	705A		
200mV	100μV	0.5% · 1	0.5% · 1	10MΩ on all ranges	1000V DC/peak AC on all ranges
2V	1mV				
20V	10mV				
200V	100mV				
1000V	1V	0.8% · 1	0.8% · 1		

AC Voltage

Range	Resolution	Accuracy (50-500 Hz)		Input Impedance	Overload Protection
		605	705A		
200mV	100μV	1% · 4	1% · 4	10MΩ on all ranges Capacitance 1000pF	750V rms on all ranges except 200mV AC ranges (15 seconds max above 250V rms AC)
2V	1mV				
20V	10mV				
200V	100mV				
750V	1V	2% · 4	2% · 4		

DC Current

Range	Resolution	Accuracy		Burden Voltage	Overload Protection
		605	705A		
200μA	100nA	NC	1% · 1	0.3V max	705A: 0.2A fuse up to 250V 605 2A fuse up to 250V 10A range not fused
2mA	1μA	1% · 1			
20mA	10μA				
200mA	100μA				
2000mA	1mA	1.5% · 1	NC		
10A	10mA	1% · 1	1% · 1	0.7V max	

NC = Not Connected

AC Current

Range	Resolution	Accuracy (50-500 Hz)		Burden Voltage	Overload Protection
		605	705A		
200μA	100nA	NC	1.2% · 4	0.3V max	705A: 0.2A fuse up to 250V 605 : 2A fuse up to 250V 10A range not fused
2mA	1μA	1.2% · 4			
20mA	10μA				
200mA	100μA				
2000mA	1mA	2% · 4	NC		
10A	10mA	1.5% · 4	1.5% · 4	0.7V max	

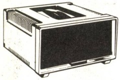
Resistance

Range	Resolution	Accuracy (Hi)		Open Voltage	Overload Protection
		605	705A		
200Ω	100mΩ	1% · 2	1% · 2	HiV 3.5V LoV 0.25V	250V DC rms on all ranges
2KΩ	1Ω	0.8% · 2	0.8% · 2		
20KΩ	10Ω				
200KΩ	100Ω				
2000KΩ	1KΩ				
20MΩ	10KΩ	2% · 4	2% · 4		

Capacitance

Range	Resolution	Accuracy		Test Signal	Max Input
		605	705A		
2nF	1pF	NC	3.5% · 4	400mV rms	3V DC peak AC on all ranges
20nF	10pF			512 Hz 40mV rms	
200nF	100pF				
2000nF	1nF				
20μF	10nF				

Did you know... Rod Irving Electronics have over 7,000 line items?!



ARLEC PC3

A professional quality, vented case with carry handle for portability when used for such projects as power supplies, battery chargers, inverters, audio amps, etc. Multiple slots and mounting positions, detachable top with plastic sides and metal back panel.

Cat. H10475 .... **$32.50**

ARLEC SUPER TOOL

A versatile 12V electric tool for...

- Sanding
- Engraving
- Grinding
- Polishing
- Cutting
- Drilling
- Milling
- Erasing, etc.

Features:
Operates on safe, low 12 volts from mains electricity via AC adaptor (supplied). Light and easy to handle with touch switch and lock for continuous running. High torque motor. 10,000 R.P.M. Can drill 2mm holes in steel. 2 year guarantee

Contents:

- 12V Super Tool
- Plugpack AC adaptor
- 1 spherical milling cutter
- 1 wire brush
- 1 grinding wheel
- 4 drill bits, 0.6, 0.8, 1.0, 1.2mm
- Set of 5 chuck collets
- 6 eraser sticks
- Instruction sheets

Cat. T12300 **$44.95**

ARLEC SUPER TORCH

A sophisticated rechargeable torch ideal for use in and around the home, the car, the boat, etc.
FEATURES:

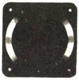
- Powerful built-in Nicad batteries.
- Reflector head swivel through 90 degrees.
- 3 position switch gives on/off/ and dim.
- Indicator lamp when recharging.
- Charges from mains, electricity or from a car battery.
- Supplied complete with
  (A) SEC approved battery charger
  (B) Plug and cord for car lighter socket.
  (C) Handy charging bracket with fixing screws.
- 12 months guarantee.

Cat. A15055 **only** **$39.95**

MICROWAVE LEAKAGE MONITOR

Use this microwave leakage detector to protect yourself and your family by periodically checking around the hinges, door seals, etc. of your microwave for hazardous excessive leakage.

Cat. A30001 **$12.95**



PHILIPS SPEAKERS

"Hopefully, we should have Philips speakers back in stock by the time you read this." -Rod.

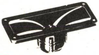
Cat. C12030 AD01610 T8	**$12.95**
Cat. C12040 AD02160 SQ8	**$34.95**
Cat. C12045 AD70620 M8	**$49.00**
Cat. C12050 AD12550 W8	**$79.00**

(or Philips equivalent supplied)

SUPER HORN TWEETER

- Requires no crossover and handles up to 100W!
- Sensitivity: 100dB/0.5m
- Frequency Response: 3kHz-30kHz
- Impedance: 8 OHMS
- Size 96mm diameter

Cat. C12102 **normally $14.95**
NOW $12.95



SUPER HORN

- Wide dispersion tweeter, handles up to 100W.
- Sensitivity: 105dB/0.5m
- Frequency Response: 3kHz-30kHz
- Impedance: 8 OHMS
- Size: 145x54mm

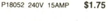
Cat. C12103 **normally $14.95**
NOW $12.95

RAINBOW CABLE

Cat.No.	Description	$/metre
W12714	28AWG 14W	**$1.80**
W12716	28AWG 16W	**$1.80**
W12720	28AWG 20W	**$2.20**
W12726	28AWG 26W	**$2.90**
W12734	28AWG 34W	**$3.60**
W12740	28AWG 40W	**$4.40**

12 WAY TERMINAL BLOCKS

P18050	240V	10AMP	**$1.50**
P18052	240V	15AMP	**$1.75**



FERRITE RODS

Cat. L11401 **$2.75**

HIGH EFFICIENCY RADIAL FIN HEATSINK

Black anodised with a thick base plate, this radial fin heatsink can dissipate large amounts of heat for maximum efficiency. Designed by Rod Irving.

105x65mm	Cat. H10524	**$2.80**
105x75mm	Cat. H10525	**$3.00**
105x150mm	Cat. H10535	**$5.50**
105x225mm	Cat. H10546	**$8.00**
105x300mm	Cat. H10549	**$12.00**

ECONOMY TRANSFORMERS

	1-9	10+
2155 Cat. M12155	$6.75	$5.95
2156 Cat. M12156	$9.50	$8.95
2851 Cat. M12851	$4.50	$3.60
6672 Cat. M16672	$9.95	$9.30
2860 Cat. M12860	$3.95	$3.80

NEW TRANSFORMER!

240V to 15V C.T. at 250 mA
Cat No. M12860

1-9	10+
$3.95	**$3.80**

XENON/STROBE TUBES

As used in projects or as replacements

Cat. M14050 **$2.95**

VOLTAGE REGULATORS BARGAINS

Description	1-9	10+
LM309KC	**$1.80**	**$1.60**
7805KC	**$1.80**	**$1.60**
7812KC	**$1.80**	**$1.60**
78405KC	**$7.80**	**$6.95**
78H12KC	**$7.80**	**$6.95**

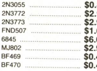
WE HAVE THE BEST MEMORY PRICES!

IC SPECIALS!

	1-9	10+	100+
4116	$1.80	$1.70	$1.60
4164	$2.95	$2.75	$2.50
2716	$5.90	$5.50	$5.50
2732	$6.25	$5.95	$5.50
2764	$6.25	$5.95	$5.00
27128	$7.00	$6.50	$6.25
6116	$2.95	$2.75	$2.50
41256	$7.00	$6.50	$6.00
6264	$6.50	$5.50	$5.25

TRANSISTOR AND IC's SPECIALS

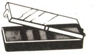
2N4240	**$0.50**
MPSA93	**$0.25**
MJ15004	**$2.90**
2N4033	**$0.30**
2N3055	**$0.80**
2N3772	**$2.90**
2N3773	**$2.90**
FND507	**$1.00**
6845	**$6.00**
MJ802	**$2.90**
BF469	**$0.40**
BF470	**$0.40**



IC STORAGE CASE

Electro static charge proof plastic IC case with conductive sponge. Dimensions: 75 x 130 x 19mm.

Cat. H10095 **$5.95**



TELECOMMUNICATION EXTENSION LEADS

Cat. Y16010 5 metre	**$12.50**
Cat. Y16012 10 metre	**$14.95**

MINI JUMPERS

- Contact terminal: Phospor bronze
- Material: P.B.T. 94V-0
- Gold plated

Qty	Cat. No.	Price
10	P12053	**$ 2.95**
25	P12055	**$ 4.95**
100	P12057	**$21.95**

ADD ON HARD DISK DRIVE FOR IBM

Includes disk controller card. Available and installed free only at our city store.
Cat. X20010

10 M Byte	**$1,195**
20 M Byte	**$1,350**

CRYSTALS SPECIALS

Prime Spec's. We just have too many in stock!

Description	Cat.No.	1-9	10+
1MHz	Y11000	$7.50	$6.50
1.8432MHz	Y11003	$7.50	$6.50
4MHz	Y11020	$2.50	$2.00
4.194304MHz	Y11022	$2.50	$2.00
4.433618MHz	Y11023	$2.50	$2.00
4.75MHz	Y11025	$2.50	$2.00
4.915200MHz	Y11026	$2.50	$2.00
5MHz	Y11030	$2.50	$2.00
6MHz	Y11040	$2.50	$2.00
6.144MHz	Y11042	$2.50	$2.00
6.670MHz	Y11045	$2.50	$2.00
8MHz	Y11050	$2.50	$2.00
8.867238MHz	Y11055	$2.50	$2.00
10MHz	Y11060	$2.50	$2.00
12MHz	Y11070	$2.50	$2.00
14.31818MHz	Y11072	$2.50	$2.00
15MHz	Y11075	$2.50	$2.00
18MHz	Y11082	$2.50	$2.00
18.432MHz	Y11085	$2.50	$2.00
20MHz	Y11090	$2.50	$2.00

RCA GOLD PLATED PLUGS AND SOCKETS

For those who need the ultimate in connection. Essential for laser disc players to get that fantastic sound quality.

Plug Cat. P10151	**$2.95**
Socket Cat. P10150	**$2.25**

4½ DIGIT LCD DPM 60

- **200mV fsd**
- **Digital Hold**
- **Bandgap Reference**
- **10uV Resolution**

A new 4½ digit LCD DPM offering levels of performance, low current consumption and compact size never previously available. The DPM-60 features Auto-zero, Auto-polarity, a logic switched 200mV or 2V fsd, Digital Hold, programmable decimal points and a 1mA current consumption. Automatic low battery indication and 'continuity' flags are built into the 10mm 4½ digit display. The DPM 60 can be readily rescaled by user to indicate many different units, amps, volts, ohms etc. Supplied complete with fixing bezel, clips and connector, the DPM 60 will suit many applications calling for low-cost, high accuracy measurements in portable instruments or bench instruments.

SPECIFICATIONS:
Accuracy: 0.01 m + 1 digit
Linearity: ± 1 digit
Samples/sec: 1.6
Temp. Stability: 50 ppm/°C typical
Temp. Range: 0 - 35°C
Supply Voltage: 7.5 - 15V
Supply Current: 1mA typically
Max DC Input Voltage: + − 20V

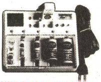
Cat. Q15520 **$99.95**

BRAND NEW FANS

Not noisy pullouts! Stacks of uses in power amps, computers, hotspot cooling etc. Anywhere you need plenty of air.

240V	4⅝"	Cat. T12461	**$12.95**
115V	4⅝"	Cat. T12463	**$12.95**
240V	3½"	Cat. T12465	**$12.95**
115V	3½"	Cat. T12467	**$12.95**

10 Fans (mixed) less 10%



UNIVERSAL BATTERY CHARGER AND TESTER

Save money on expensive batteries with this universal battery charger. Features include meter tester, and provisions for D, C, AA, AAA, N, button and cell batteries, 9V and 6V (square types). Comes complete with detailed instructions.

Cat. M23533 **$24.95**

CORDLESS RECHARGEABLE SOLDERING IRON

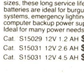
- Built in solder point illumination
- Easy replacement of solder tip
- Protective stand which also functions as charging unit
- Sponge pad attach to stand
- Plug pack power adaptor
- Includes Nicad battery
- Instructtion manual
- 12 months warranty

Cat. T12480 **$49.95**

RECHARGEABLE 12V GELL BATTERIES

Leakproof and in 3 convenient sizes, these long service life batteries are ideal for burgular systems, emergency lighting or as a computer backup power supply. Ideal for many power needs.

Cat. S15029	12V	1.2 AH	**$12.95**
Cat. S15031	12V	2.6 AH	**$39.50**
Cat. S15031	12V	4.5 AH	**$49.95**



"IBM AT STYLE" COMPUTER CASING

Our latest computer casing, featuring security key switch, 8 slots, and mounting accessories etc. Dimensions: 490(W)x145(H)x400(D)

Cat. X11091 **$139**

COMPUTER CHESS! by SciSys.

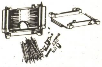
SciSys computer chess games are endorsed by Garry Kasparov, world's highest rated chess player, and are available from Rod Irving Electronics!

TURBO 16K

This brand new chess computer sets new standards in user convenience, and beats 92% of all chess players with its powerful 16K program.
Features:
Instant response

- Solves mate in 10 moves
- Internal clock with 2 LCD displays
- Displays moves considered
- Thinks in opponent's time
- Takes back
- 17 Levels
- 2 Year memory
- Mains adaptor socket

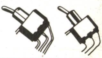
Cat. C30010 **$295**



RS232 MINI PATCH BOX

- Interface RS232 devices
- With male to female 25 pin inputs
- 25 leads with tinned end supplied
- Complete with instructions

Cat. X15654 **$25.95**



QUALITY RIGHT ANGLE TOGGLE SWITCHES

S11040 S.P.D.T. RA PCB	**$1.50**
S11042 D.P.D.T. RA PCB	**$1.60**

rie

ROD IRVING ELECTRONICS
425 High Street, NORTHCOTE, 3070
VICTORIA, AUSTRALIA
Phone (03) 489 8866
48 A'Beckett St, MELBOURNE, 3000
VICTORIA, AUSTRALIA
Ph. (03) 663 6151
Mail Order and correspondance:
P.O. Box 620, CLAYTON 3168
TELEX: AA 151938

MAIL ORDER HOTLINE
(03) 543 7877
(2 lines)

POSTAGE RATES

$1-$9.99	$2.00
$10-$24.99	$3.00
$25-$49.99	$4.00
$50-$99.99	$5.00
$100-199	$7.50
$200-$499	$10.00
$500 plus	$12.50

This is for basic postage only. Comet Road freight, bulky and fragile items will be charged at different rates.

Certified Post for orders over $100 included "free"!
Registered Post for orders over $200 included "free"!

All sales tax exempt orders and wholesale inquiries to RITRONICS WHOLESALE, 56 Renver Rd., Clayton Phone (03) 543 2166

MasterCard VISA

Errors and Omissions Excepted.

Philips CD555 portable music system

Well, at last it has happened. There is now a "CD ghetto-blaster". Philips' CD555 machine incorporates a compact disc player, auto-reverse cassette deck, FM stereo with multi-band AM tuner, five-band graphic equaliser and a 14W per channel stereo amplifier. In short, it's got the lot.

Ghetto-blasters are ubiquitous. Seen and heard everywhere, they are the 80's equivalent of the old 5-valve mantel radio. Most of them offer fairly ordinary performance in a fancy-looking package. Now Philips has changed the name of the game by releasing a machine with a CD player inside.

This means that it now has a machine potentially capable of very good performance, at least from the CD player side. But is it any good?

In appearance, the new Philips CD555 is certainly an impressive machine with its compact size, LCD readouts, numerous slider and pushbutton controls plus large compact disc and cassette loading doors.

Overall size of the player itself is 320 x 220 x 230mm (W x H x D), while the detachable loudspeakers measure 175 x 220 x 210mm. The handsome colour scheme consists mainly of a metallic grey finish on the case which highlights all the silver control buttons.

At the top left hand side of the control panel are the on/off switch and the slider controls for the five-band equaliser. These have a maximum of 10dB boost and cut centred on 63Hz, 250Hz, 4kHz and 16kHz. Two further sliders are provided for the microphone input level and balance controls.

At the top right hand side are the coarse and fine tuning knobs for the FM and AM medium and shortwave bands, while below the tuning dial are the band selection and mode selection pushbuttons.

At the lower right hand side are located the sockets for a pair of stereo headphones and a microphone. The remaining pushbuttons on the lower portion of the front panel are for the cassette and CD player functions.

Compact Disc Player

The CD player has vertical front disc loading, and pressing the Eject button opens the compartment door to accept a compact disc. When the drawer is closed by hand, the number of tracks on the disc is indicated on the liquid crystal display.

Controls are provided to include programming and repeat, audible fast forward and reverse, and previous next track selections. A Time/Track switch selects whether the display shows the elapsed time for each track or the track and index number. When displaying time, the word "Time" is indicated on the display.

Other display indications are "Pause" and "Error" which occur whenever the Pause switch is pressed and whenever a

fault, such as no disc in the mechanism, occurs.

Cassette Player

The auto-reverse cassette player has similar play and programming functions to the CD player, and these are indicated by the liquid crystal display when selected. The auto-reverse mechanism is very nifty, with the record/play and erase head assembly rotating very smartly and snapping into place whenever a change in tape direction is called for.

The machine also incorporates automatic sensing so that there is no need for tape type selection buttons. Naturally, as you would expect from any machine which had any pretension to quality, the CD555 includes Dolby noise reduction.

Recording modes

Three recording modes are provided. Normally, the "Record" button is used to record from all sources except for compact disc. CD recordings are made using the "Record/Mode" instead of the "Record" switch. It has two functions; when pressed once, the cassette player and CD player are synchronised so that the recorder is controlled by actuating the CD player keys.

Pressing the Record/Mode switch twice gives a four second quiet passage between each recorded track. These pauses are necessary if the player is to discern between tracks when track order programming is used on playback.

Loudspeakers

The loudspeakers for the CD555 can be clipped on or detached from the player unit. Each consists of a fully-sealed particle board enclosure with a fancy plastic grille plate. Behind this is a 40mm cone tweeter and a small woofer with a roll surround and an effective cone diameter of about 95mm.

Naturally, the system will sound better with higher quality external speakers but these small units sound quite pleasant.

Performance

We were particularly interested to measure the performance of the compact disc player to see if it was as good as other players from the Philips stable. We measured the performance via the line outputs of the machine.

Frequency response was very flat across the audio band and was only 0.25dB down at 18kHz and 0.5dB down at 20kHz. Distortion was .0045% down at 20Hz and then rose gradually to .008% at 1kHz.

Linearity was very good down to a level of −70dB. At −80dB the error was 2dB and at −90dB there was a 5dB error, mainly due to the residual noise. The signal-to-noise ratio was 90dB. Separation between channels ranged from −80dB at 100Hz to −60dB at 10kHz and 20kHz.

We checked the tracking performance of the CD555 using the Philips NR4A test disc. This has a simulated fingerprint, artificial dirt spots and interruptions in the information layer. As is typical of the better-performing compact disc players, the CD555 managed to play through all of the disc without an audible hiccup.

The machine also appears to be quite immune to heavy vibration and knocks to the cabinet which is really a mandatory requirement for a portable player.

All the above results clearly show that Philips have not compromised the CD performance of this machine at all. It is every bit as good as a normal CD player deck and could easily double as a CD deck connected to the home hifi system.

Brief tests of the power amplifiers showed that they could deliver 18 watts into 4Ω loads with one channel driven at 1kHz. With both channels driven, it produced 14 watts into 4Ω loads. Distortion at 1W and 1kHz was measured at 0.2%.

We did not spend much time assessing the FM and AM tuners as we understand that the production machines to be sold in Australia would be different from our sample prototype, particularly for the AM bands. However, the prototype did give quite acceptable performance on FM stations and the AM performance was usable even if it was in mono and of narrow bandwidth.

Both the CD and tape player provided excellent sound quality on headphones and a good clean sound with the loudspeakers.

For those who want a comprehensive portable music system which includes a compact disc player, the Philips CD555 is a very attractive machine. Recommended retail price is $899. The machine should be widely available from department stores by the time this review appears. (J.C.)

Looking to purchase instruments

We are stockists of *Hitachi, Fluke, Trio, Goodwill, Meguro, Aaron* and *Kikusui:* so if you're in the market for an oscilliscope, think of *David Reid.*

20 MHz KIKUSUI COS5020

$629.00

+ 20% Sales Tax

INCLUDING TWO PROBES

NOW WITH 2YR WARRANTY

〈**Vertical Axis**〉, 1-2-5 sequence, 10 range; **Sensitivity,** 5mV/DIV ~ 5V/DIV, (within ± 3%); **Frequency response,** DC (AC: 10Hz) ~ 20MHz (−3dB, 8DIV); **Operation mode,** CH1, CH2, DUAL, ADD, X-Y (DUAL automatic switching ALT and CHOP); 〈**Horizontal Axis**〉, 1-2-5 sequence, 20 ranges; **Sweep time,** 0.2μ sec ~ 0.5sec/DIV (within ± 3%); **(with 10 × MAG.),** 20nsec ~ 50msec/DIV (within ± 5%).

40 MHz KIKUSUI COS5041

$1167.00

+ 20% Sales Tax

INCLUDING TWO PROBES AND DUST COVER

〈**Vertical Axis**〉, 1-2-5 sequence, 10 range; **Sensitivity,** 5mV/DIV ~ 5V/DIV, (within ± 3%); **Frequency response,** DC (AC:10Hz) ~ 40MHz (−3dB, 8DIV); **Operation mode,** CH1, CH2, DUAL, ADD, X-Y (DUAL automatic switching ALT and CHOP); 〈**Horizontal Axis**〉, (A: Main sweep, B: Delayed sweep); **Sweep time,** 1-2-5 sequence, A: 20 ranges, B: 11 ranges; A: 0.2μ sec ~ 0.5 sec/DIV (within ± 3%); B: 0.2μ sec ~ 0.5 sec/DIV (within ± 3%); **(with 10 × MAG),** A: 20n sec ~ 50m sec/DIV (with ± 5%); B: 20n sec ~ 50m sec/DIV (with ± 5%).

ESCORT MULTIMETERS

EDM 1105 **$75.00**
● 3½ digits. ● Six functions: DCV, ACV, DCA, ACA, OHM, Diode Testing. ● 0.8% basic DC accuracy.

EDM 1116 **$100.00**
● New model complete with transistor and capacitor tester.

EDM 1125 **$108.00**
● 3½ digits. ● Seven functions: DCV, ACV, DCA, ACA, OHM, Diode Testing, Audible Continuity. ● 0.25% basic DC accuracy.

EDM 1135 **$140.00**
● 3½ digits. ● Eight functions: DCV, ACV, DCA, ACA, OHM, Diode Testing, Audible Continuity. ● 0.1% basic DC accuracy.

EDM 1346 **$225.00**
● 4½ digits. ● Eight functions: DCV, ACV, DCA, ACA, OHM, Audible Continuity Testing, Diode Testing, Data Hold. ● 0.05% basic DC accuracy.

All multimeters + 20% Sales Tax

GAG-808A AUDIO GENERATOR

$203.00

Covers 10Hz to 1MHz

● 20Vp-p open circuit output ● Sine and Square wave outputs ● External sync ● 600 ohm output impedance

ALL PRICES SHOWN DO NOT INCLUDE SALES TAX. ADD 20%

These are just a few of the many 100's of up-to-date Electronic items on display at:

DAVID REID ELECTRONICS LIMITED
127 York Street, Sydney, 2000
or Telephone (02) 267 1385

Track down hidden transmitters

Build this radio direction finder

Want to find out where a radio signal is coming from? Or locate the source of an illegal transmitter? The radio direction finder described here will track it down using an electronically rotated antenna.

by GREG SWAIN

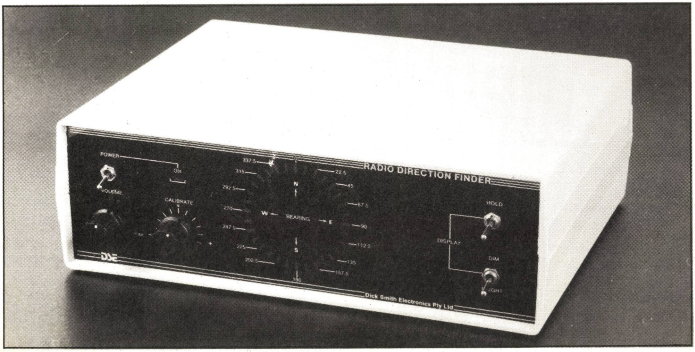
Physically, the radio direction finder consists of two separate units. One contains the control and display electronics and is located adjacent to an FM transceiver or receiver; the other is a special antenna switching unit (ASU) which is connected to the control unit via a 4-way cable.

An electronic "compass" display consisting of 32 LEDs indicates the transmitter bearing. When a signal is received, its relative bearing to the antenna system is indicated by whichever of the 32 LEDs illuminates.

In fixed installations, this allows the compass bearing of the signal to be directly indicated to within ±5.6 degrees. When installed in a car, successive readings allow you to pinpoint the exact location of the transmitter.

As such, the Dick Smith Radio Direction Finder (or RDF for short) is just the ticket for tracking down illegal transmitters and anti-social radio operators. Depending on the antenna system, it can operate on any band within the range 50-500MHz and will work with FM receivers ranging from pocket scanners to amateur radio and CB transceivers.

Radio direction finders of this type can cost around $600 or more, but this unit can be built for just $139. It was developed at Dick Smith Electronics and is available as a complete kit of



The relative bearing of the transmitter is indicated on a 32-LED compass rose.

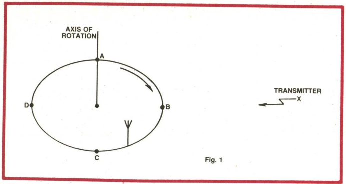


Fig. 1: signals received by an antenna mounted on the edge of a rotating disc are frequency modulated due to the Doppler effect.

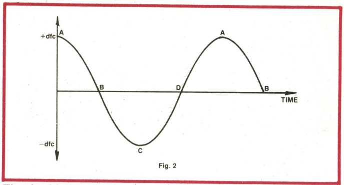


Fig. 2: this graph illustrates the frequency shift as the antenna moves towards and away from the transmitter.

parts. We think it will be especially popular with amateur radio operators.

How it works

The theory of operation is reasonably simple. Radio signals received on a rapidly moving antenna undergo a frequency shift due to the Doppler effect, an effect well known to anyone who has observed a moving car with its horn blowing.

Consider a single antenna mounted on the edge of a rapidly spinning disc. As the antenna moves towards the source of the RF carrier, the apparent frequency will increase due to the Doppler effect. Conversely, as the antenna moves away, the frequency will decrease.

Thus, the rotating antenna causes frequency modulation of the received carrier. When this type of antenna is connected to an FM receiver (the type most often used on 2 metres), a tone is heard.

By analysing the phase of this tone, the direction of the transmitter can be determined.

To avoid the obvious drawback of a mechanically rotated system, the Dick Smith RDF simulates a rotating antenna electronically. Four vertical whip antennas are arranged around a circle of diameter .07-0.4 wavelengths. These are electronically switched clockwise in sequence such that all four antennas are scanned once every 1/1250th of a second.

This situation is equivalent to one vertical antenna mounted on the perimeter of a disc spinning at 1250 revolutions per second. For a diameter of say 800mm (for the 2-metre band), this results in a tangential velocity of 3140 metres per second.

The deviation of the received carrier is determined as follows. For $V << C$, we can neglect relativistic effects and write:

$$Fr/Ft = 1 - V/C$$
$$\text{also } dF = |Fr - Ft|$$
$$\text{therefore } dF = Ft \times V/C$$

where Fr is the received frequency, Ft is the transmitter frequency, dF is the frequency shift, C is the velocity of light (3×10^8 m/s) and V is the antenna velocity.

For V = 3140 m/s and Ft = 144MHz, the carrier will deviate 1.5kHz at a rate of 1250Hz. For lower carrier frequencies, the deviation will be proportionally lower.

Note, however, that the 1250Hz modulating tone remains constant as it is a function of the antenna switching rate only.

The output from the FM receiver is applied to the signal input of the RDF adapter and compared with an internal reference phase. The resultant phase angle appears as a 5-bit binary code and this is decoded to a one-of-32 output to drive the appropriate indicator LED.

In addition, the detected audio tone can be monitored on an internal loudspeaker. This provides audible indication that the receiver is correctly tuned to the transmitter frequency.

The circuit

Antenna switching is accomplished by first deriving a 2-bit binary code from a 1MHz master oscillator. Here's how it's done:

Inverter stages IC2a, b & c (4069) form the 1MHz oscillator with buffering provided by IC2d. This clocks decade counters IC4 and IC7, both of which divide by five to produce a 40kHz signal on pin 1 (CK) of IC10.

IC10 is a 4024 7-stage binary counter. Its Q1-Q5 outputs directly drive the D1-D5 inputs of IC12, a 40174 hex latch, while Q4 and Q5 also drive IC9 which is a 4555 one-of-four decoder.

What happens is that IC9 accepts a 2-bit binary code from IC10 and provides the quadrature antenna switching signals. These signals are interfaced by a 1488 line driver (IC6). The outputs of IC6 swing positive and negative in sequence to provide bias for the matrix diodes (D201-D208) in the antenna switching unit (ASU).

The diode matrix is arranged so that, at any given instant, three of the antennas are effectively shorted and only one is coupled to the receiver. For example, when pin 11 of IC6 is low (−9V), D205-D207 are forward biased and short out antennas 2 to 4.

At the same time, D201 will also be forward biased while D202-D204 are turned off. Antenna 1 will thus be connected to the receiver.

The detected audio tone from the FM receiver is applied to the input of the RDF adapter, limited by D1 and D2, and filtered by a single-pole active lowpass filter stage (IC5). This chip is described by National Semiconductor as an MF5 Universal Monolithic Switched Capacitor Filter. Basically, it is a general purpose active filter building block.

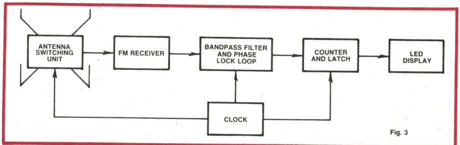
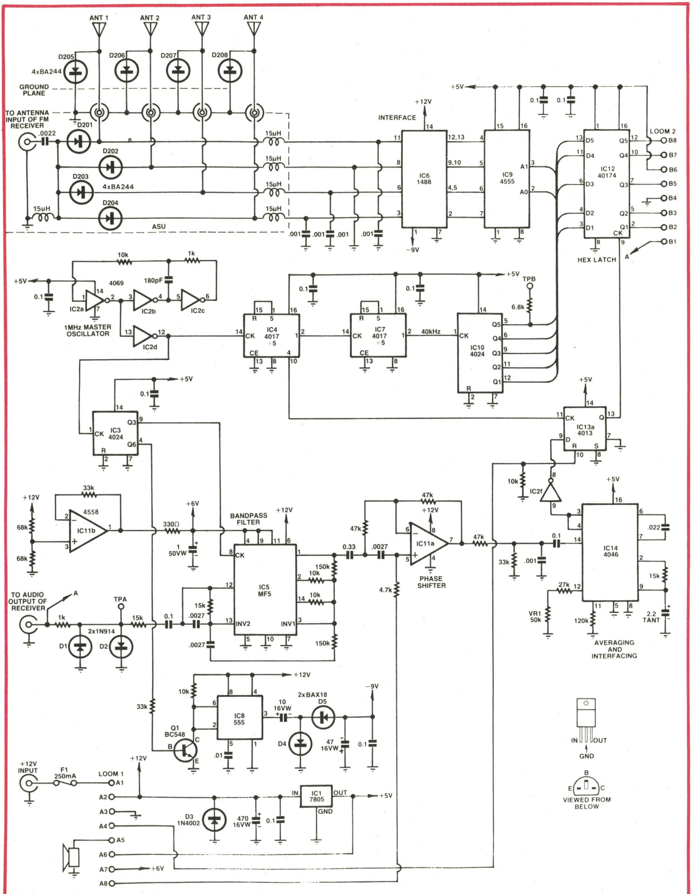
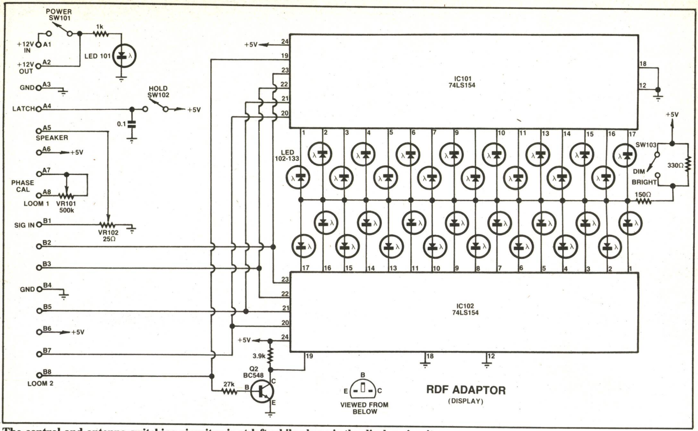


Fig. 3: block diagram of the Radio Direction Finder. Signals from the antenna switching unit are fed to an FM receiver and the output compared to a reference phase.


ANT 1
ANT 2
ANT 3
ANT 4
D205
D206
D207
D208
4xBA244
GROUND PLANE
TO ANTENNA INPUT OF FM RECEIVER
D201
D202
D203
D204
4xBA244
.0022
15µH
ASU
.001
INTERFACE
+12V
IC6 1488
-9V
IC9 4555
A1
A0
+5V
0.1
IC12 40174
HEX LATCH
LOOM 2
B8
B7
B6
B5
B4
B3
B2
B1
10k
1k
180pF
4069
IC2a
IC2b
IC2c
IC2d
1MHz MASTER OSCILLATOR
IC4 4017 ÷5
IC7 4017 ÷5
40kHz
IC10 4024
TPB
6.8k
IC3 4024
IC13a 4013
IC2f
+6V
33k
68k
4558
IC11b
330Ω
1 50VW
BANDPASS FILTER
IC5 MF5
INV1
INV2
150k
15k
.0027
47k
0.33
IC11a
PHASE SHIFTER
4.7k
IC14 4046
.022
15k
2.2 TANT
27k
VR1 50k
120k
AVERAGING AND INTERFACING
TO AUDIO OUTPUT OF RECEIVER
TPA
2x1N914
D1
D2
IC8 555
10 16VW
2xBAX18
D5
D4
47 16VW
Q1 BC548
+12V INPUT
F1 250mA
LOOM 1
A1
A2
A3
A4
A5
A6
A7
A8
IC1 7805
IN
OUT
GND
D3 1N4002
470 16VW
IN
OUT
GND
B
E
C
VIEWED FROM BELOW

RDF ADAPTOR



The control and antenna switching circuitry is at left while above is the display circuit.

Radio direction finder

The rest of IC5 is configured as a second-order bandpass filter to remove unwanted audio modulation from the 1250Hz tone. The centre frequency of the filter is set to 1250Hz by the clock signal applied to pin 8. This clock signal is derived via IC3 which divides the 1MHz master oscillator signal by eight.

Note that the clock for the bandpass filter is derived from the same source as that used to switch the antennas. This means that the filter is automatically centred on the scanning tone, even when there is some frequency drift.

The output of IC5 (pin 1) is a sine wave with a nominal frequency of 1250Hz. This signal is applied to op amp IC11a which functions as a phase shifter. Adjustment of the phase shifter is by means of VR1.

The job of the phase shifter is to allow calibration of the circuit and to compensate for any audio phase shifts in the receiver.

From there, the signal is further processed by a 4046 phase lock loop (PLL). The function of this stage is to average out any modulation present in the passband of IC5 and to produce a 1250Hz square wave which is essentially free of noise and jitter.

It is this signal that is used to latch IC12. The output of the PLL (pins 3 & 4) is first inverted by IC2f and applied to D-type flipflop IC13a. Subsequently, when D goes high, IC13a latches IC12 on the first positive-going clock pulse from pin 10 of IC4.

The result of all this is that IC12 is latched with a 5-bit code which is directly related to the transmitter direction. A phase comparator function is thus performed.

Note that IC13a is necessary to prevent the latching signal from coinciding with a change of data on IC12's inputs.

A pair of 74LS154 one-of-16 decoders (IC101 and IC102) on the display board converts the 5-bit code to a one-of-32 output. These decoders directly drive the 32 display LEDs to indicate the transmitter position.

Switch SW102 allows the display to be held or "frozen" by resetting IC13a. SW101 serves as a power on/off switch, while SW103 allows the display to be dimmed by switching a 330Ω resistor into the common anode circuit of the LED display.

To make the unit as easy as possible to use, the audio output from the FM receiver is also fed to an internal loud-

Where to buy the kit

The Radio Direction Finder described here was developed by the Research and Development Department at Dick Smith Electronics Pty Ltd. It is available as a complete kit of parts by mail order or from your nearest Dick Smith Electronics store.

The kit comes complete and includes a perspex front panel, screen-printed fibreglass PC boards, antenna bases, plugs and sockets, and a detailed construction manual. The cost is $139 plus postage and packing charges where applicable.

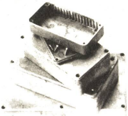
Mail orders should be sent to: Dick Smith Electronics Pty Ltd, PO Box 321, North Ryde, NSW 2113. Phone (02) 888-2105.

Note: all PC artworks for this project are copyright Dick Smith Electronics Pty Ltd.

PUT DSE TO THE TEST

DSE'S PICK A BOX ... WE'RE NO.1

ALUMINIUM DIECAST BOXES



WOW! Precision metal boxes at a price you can afford! These boxes feature channelled walls and withstand extremely high temperatures. Ideal for RF circuits and circuits involving heat.

190x60x110mm.	H-2201	**$13.95**
150x50x80mm.	H-2206	**$9.95**
120x40x65mm.	H-2211	**$6.95**
100x25x50mm.	H-2221	**$4.95**

ALUMINIUM BOXES

Boxes come in two pieces which slide together: screws hold them for storage. They're versatile and inexpensive.

110x51x70mm.	H-2300	**$2.65**	**133x76x54mm.**	H-2325	**$3.20**
104x60x46mm.	H-2305	**$2.30**	**152x132x103mm.**	H-2330	**$4.75**
127x102x76mm.	H-2320	**$3.75**	**180x158x118mm.**	H-2335	**$7.75**

INSTRUMENT CASES

Great range of plastic instrument case for all your project needs. With slots, ventilation ... the lot!

203x102x254mm.	H-2455	**$24.00**	**200x160x65mm.**	H-2505	**$12.95**
228x76x305mm.	H-2465	**$24.00**	**200x135x95mm.**	H-2506	**$12.95**
95x145x45mm.	H-2503	**$10.95**	**250x190x80mm.**	H-2507	**$19.95**
200x145x75mm.	H-2504	**$13.95**			

19" RACK ZIP PACK

Storage system for CB, receivers, etc. 358mm deep. Contains all parts.

H-2470 **$139**

19" RACK MOUNTING CASE

Top quality case. Takes moments to assemble. Heavy-guage metal front/top/bottom. Pre-punched for ventilation.

$49.95 Cat H-2481

PLASTIC INSTRUMENT CASES

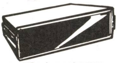
No matter what the job, DSE have an instrument case: for communications, power supplies, etc.

Power Supply case. 130x130x75mm.

$7.95 H-2516

Instrument case. 210x27x73mm

$34.95 H-2525



Instrument/Equipment case. 210x175x55mm.

$13.95 H-2520

COMPONENT DRAWS & CABINETS

Great way to organise all your bits 'n pieces ... you'll find them quickly and easily.

16 DRAWER CABINET

Cabinet : 300x180x140mm.

Cat H-2588 **$22.50**

COMPARTMENT CASE

Made of strong plastic. With clear lid, movable internal compartments and 2 tiers of trays. Cat H-2596

$29.50

STACKABLE DRAWERS

Flexibility! Vertical or horizontal stacking. With handle, index card on each drawer.

One drawer. Cat H-2584 **$3.25**

Two drawer. Cat H-2585 **$3.25**

PLASTIC TOOL BOXES

435x190x180mm. Cat H-2601 $16.95

430x230x200mm. Cat H-2600 **$32.95**

ZIPPY BOXES

These are it! The original Zippy boxes recommended by magazines because of their versatility. Ribbed sides are ideal for mounting PC boards.

28x54x83mm.	H-2755	**$1.95**
41x68x130mm.	H-2753	**$2.45**
50x90x150mm.	H-2751	**$2.95**
60x113x196mm.	H-2752	**$4.45**

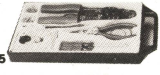
WE'VE GOT BOOKS COVERED!

Here's just a sample of DSE's large selection of informative, high quality books. They're priced to please and very popular, so get in quick. While you're there why not check out all the other titles available!

Under I.C. OP AMPS	B-1180	**$13.50**
OP-AMP Circuit Design	B-1251	**$17.95**
Basic Electronics Theory	B-1615	**$19.50**
Basic Electronics Courses	B-1689	**$19.50**
Funway 1 Into Electronics	B-2600	**$4.95**
Funway 2 Into Electronics	B-2605	**$6.95**
Funway 3 Into Electronics	B-2610	**$6.95**
Electronics A Practical Introduction	B-3005	**$9.50**
Electronics Dicitionary	B-3610	**$9.95**
Basic Electronics	B-3620	**$4.50**
Under D.C. Power Supplies	B-3623	**$19.50**
Note Book — Starting in TTL	B-3629	**$3.50**
Note Book — Vol 1	B-3630	**$2.40**
Note Book — Vol 2	B-3631	**$2.60**
Note Book — Vol 3	B-3634	**$2.80**
Introduction Electronics — Sardi	B-3635	**$7.95**
Encyclopaedia of Electronic CCTS	B-1760	**$45.95**
Digital I.C.'s and LEDS	B-1785	**$22.95**
Fibre Optics	B-1865	**$22.95**

SEE DSE FOR TOOLS BEFORE IT'S TOOLATE!

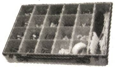
WOW! 38-PC TOOL KIT WITH MULTIMETER



Excellent value! Carry out auto repairs ... anything. Has all the tools you could want: crimping tool, wire, tape, screwdriver and more!PLUS comes with FREE multimeter. **$29.95**

Cat T-4832

MORE VALUE! 68-PC KIT WITH CONTINUITY TESTER



What more could you ask ... great variety of handy tools for all types of repairs PLUS a neon tester for 240V equipment.

Cat T4834 **$14.95**

DALO MARKING PEN

Great for precision board marking prior to etching — thanks to unique Press-to-Mark feature.

Cat T-5170 **$3.50**

DON'T 'FRET'

With this handy piercing saw, modellers, hobbyists can cut through plastic, etc. Adjustable universal frame even lets you use broken blades. Comes with 3 blades.

Cat T-4965 **$14.25**

SOLDER SUCKER

Perfect accessory for the handyman, hobbyist! Removes solder in no time. Rugged metal construction takes rough treatment — lasts for years. Features Teflon tip, nozzle sweeper and light thumb release mechanism.

Cat T-2560 **$9.95**

DESOLDERING TOOL

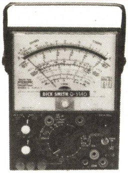
If your job or hobby involves solder then this is a 'must'! It desolders cleanly, quickly and thoroughly. Ideal for PC boards, prototyping and many other applications.

Cat T-1340 **$69**

WE'VE GOT THE LOT!

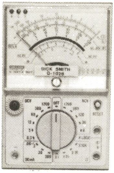
VALUE! 6.5 MHz OSCILLOSCOPE

An oscilloscope hobbyists can afford! Features retrace blanking, 10mV/div vertical sensitivity and 500mV/div horizontal, 4-range time base and much more.
Cat Q-1280 **$299**



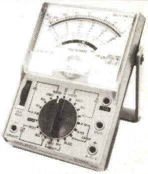
METER/ TRANSISTOR & CAP TESTER ...

Amazing! It's a powerful 100K ohm multimeter PLUS tests transistors and capacitors.
Cat Q-1140
$53 each for two! **$85**



VERSATILE METER/TESTER!

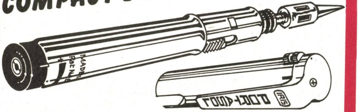
Here's value! Not only do you have a great 20K ohm multimeter, but also a built-in logic tester. That's virtually two instruments. The tester's LEDs give HIGH, LOW & PULSE.
Cat Q-1026 **$34.50**



BUDGET MULTIMETER

WOW! Great DSE value... 20K ohms/volt multimeter with features normally reserved for expensive testers. There's continuity buzzer, 10A DC range PLUS mirrored scale and reliable banana plugs.
Cat Q-1022 **$29.95**

REVOLUTIONARY 'BUTANE' COMPACT SOLDERING IRON!!



This amazing iron is worth a double WOW! It's a powerful, cordless iron the size of a marker pen. Refillable butane provides 'instant' heat for on-the-spot emergencies. Adjustable temperature provides equivalent 10-60 watts ... up to one hour continuous use. Tip temperature 400°C

$69.50

Cat T-1370

'GALAXY' 3.5 DIGIT PANEL METER

Ideal replacement for analogue meters. Provides accurate digital display, is unsusceptible to movement and can be read in daylight. 220mV FSD. Cat Q-2200

$49.95

buy 5 for $44.95 each

DATA SHEET AVAILABLE

'ADCOLA' 12W SOLDERING IRON

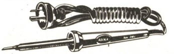
What a saving! A reliable iron ideal for hobbyists and general commercial work. Features hi impact plastic handle, Triclad 3mm long life tip. Cat T-1820

Was $27.50 NOW $22.95

FOR HEAVIER JOBS

Adcola's 16 watt iron is ideal ... especially in commercial environments. It's heavier element provides more power and features a 5mm Triclad long life tip.
Cat T- 1825

Was $32.95 NOW $27.50



SAVINGS! FUNWAY III IC PROJECTS

Auto Minder	Cat K-2660	Was $4.95	**Now $3.95**
Two-Up	Cat K-2661	Was $6.95	**Now $5.95**
Pokey	Cat K-2662	Was $14.05	**Now $11.95**
Cricket	Cat K-2663	Was $9.95	**Now $7.95**
Mini Colour Organ	Cat K-2664	Was $6.95	**Now $5.95**
Light and Sound	Cat K-2665	Was $6.95	**Now $4.95**
Combined Timber Lock	Cat K-2666	Was $9.95	**Now $7.95**
Mini Amp	Cat K-2667	Was $14.95	**Now $11.95**
Binary Bingo	Cat K-2668	Was $12.95	**Now $10.95**
Mini Synthesiser	Cat K-2669	Was $12.95	**Now $10.05**
Funway Bonus Pack	Cat K-2670	Was $24.90	**Now $19.95**

DICK SMITH ELECTRONICS
PTY LTD
For Address details See P98

B 109

Radio direction finder

Antennas and Operation

For mobile operation, four ¼-wave vertical whip antennas attached to a roof-rack assembly would be the best approach. The ASU could then be conveniently located between the antennas. It should be weatherproofed using a silicone sealant.

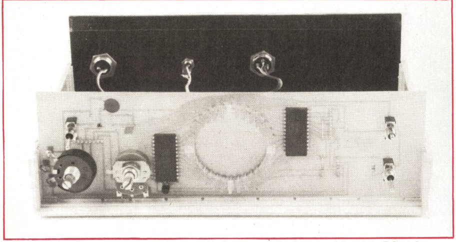
In most cases, a separate ground plane will have to be provided adjacent to the antenna bases. A suggested method is to secure a sheet of aluminium to the roof-rack. Make sure that the assembly cannot come adrift.

A hand-held transceiver can be used to aid the initial setting-up procedure. Depending on the set-up, it may be necessary to "rotate" the antenna array until the compass rose reads true relative to the direction of the vehicle.

The calibrate control can be used to make the final adjustment. A walk around the antenna array with the hand-held transceiver will then reveal if the installation is functioning correctly. This should take place in an open area to avoid strong signal reflections.

In the case of a fixed installation, four ground plane antennas should be mounted symmetrically on a vertical mast, together with the ASU. The array can then be adjusted so that the compass rose displays the true bearing with the calibrate control set to mid-position.

Note that, in either case, the distance between opposing antennas should be between .07 and 0.4 wavelengths.



This view shows the completed display board. The pot leads are soldered to PC stakes.

speaker. The volume is adjusted by means of potentiometer VR102 which is mounted on the front panel.

Power supply

Power for the RDF unit is derived from an external 12V source which connects to a 2-pole socket on the rear panel. This supplies +12V direct to several ICs and to the input of 3-terminal regulator IC1. IC1, in turn, supplies a regulated +5V rail to the remaining ICs.

Op amp IC11b provides a buffered +6V rail to IC5 and also to the phase calibration control (VR101).

Finally, a −9V supply rail is required for the 1488 line driver IC. This is generated by a DC-DC converter circuit based on 555 timer IC8. It buffers a 16kHz square wave derived from IC3 and drives a diode charge pump based on D4 and D5 to produce the required −9V rail.

Transistor Q1 simply functions as a switch. Its job is to interface the +5V CMOS circuit to the +12V 555 circuit.

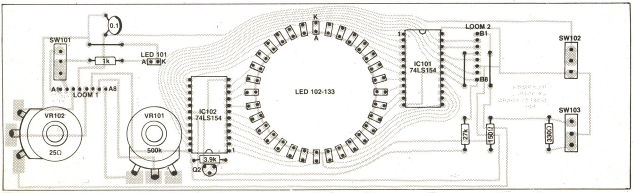
Construction

Construction is straightforward with most of the parts mounted on three PC boards, two in the main unit and one in the ASU. These boards are coded ZA-1543a, ZA-1543b and ZA1543c.

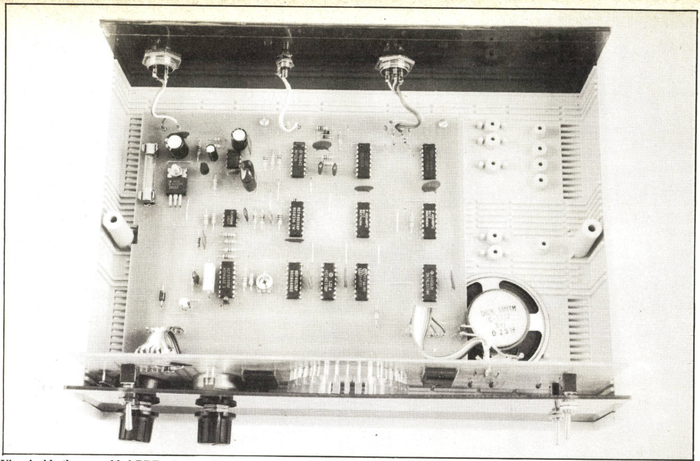
A plastic instrument case fitted with a perspex front panel houses the control electronics, while the ASU board is housed in a plastic zippy case.

Begin by constructing the main PC board (ZA-1543a). No special procedure need be followed when assembling the board although we suggest that the larger components be left till last. Note carefully the orientation of the semiconductors and electrolytic capacitors when they are being installed.

The 7805 regulator is installed so that



Parts layout for the display PC board. Note that the two ICs face in opposite directions.



View inside the assembled RDF adaptor. Note mounting details for the front panel and the display board.

its metal tab lies flat against the board. It is then secured using a machine screw and nut. Note that PC pins are used to terminate all external wiring connections.

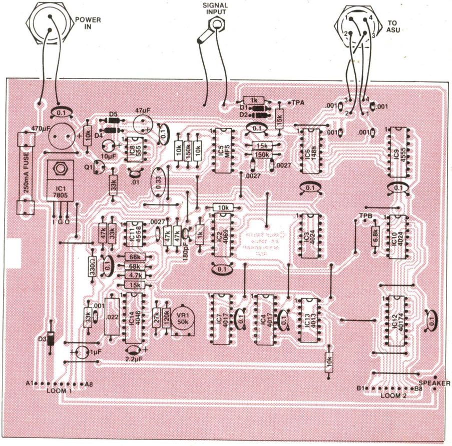
The display board (ZA-1543b) is constructed next. Begin by mounting all parts except for the two potentiometers and the 33 LEDs. Be careful with the orientation of the two LS154 decoder ICs as they face in opposite directions.

PC pins are used to terminate the wiring connections to the main board and to terminate the pot terminals. With the exception of the pot terminals, these should all be mounted on the copper side of the board.

Next, press all the LEDs into the board, noting that the yellow LEDs should be used for the quadrant markers and the red LED for power indication. Make sure that all the LEDs are correctly oriented — the anode lead is the longer of the two.

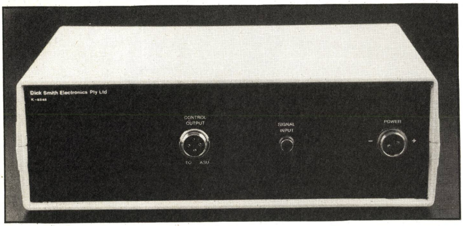
Do not solder them in at this stage as they must be aligned with the front panel later on.

Attention can now be turned to the perspex front panel. Using a smooth file, carefully file a radius on each corner. This is to prevent the right-angled corners of the panel from biting into the instrument case when it is eventually assembled.



Parts layout for the main PC board. Take care with component orientation.

Radio direction finder



The rear panel sockets connect to the ASU, FM receiver and +12V power supply.

The spacing between the PC board and the front panel is adjusted next. This procedure should be followed carefully, as it sets the length of the LED leads.

Attach the two pots to the front panel, then bolt the front panel to the display board via the switch nuts. Note that there should be two nuts on each switch — one behind the panel and the other in front.

The board-to-panel spacing can now be adjusted by inserting them into their respective slots in the instrument case. The panel slides into the first slot while the PC board should fit into the third slot from the front of the case.

Adjust the nuts on the switches as necessary to achieve the correct alignment. This done, the pot terminations can be soldered to their adjacent PC pins.

With the front panel assembly now correctly aligned, the display LEDs can be soldered in position. To do this, remove the assembly from the case and push the LEDs forward so that they butt against their respective viewing windows. Finally, solder the LEDs to the board and adjust the alignment of each by hand as necessary.

This completes the construction of the main board and display panel assemblies. The boards can now be installed in the case and the wiring to the front and rear panels completed according to the wiring diagram.

The loudspeaker is glued to the bottom of the case using epoxy adhesive while the main board is secured by means of the four self-tapping screws supplied. Wiring between the main board and the front and rear panels can be run using rainbow cable.

ASU construction

Commence construction of the ASU by installing the parts on the PC board (ZA-1543c) according to the parts layout diagram. This done, prepare 11 40mm lengths of tinned copper wire and solder them to the socket termination points, with the wires protruding from the copper side of the board.

Once the PC board has been assembled, drill the zippy box according to the diagram supplied with the kit and fit the plugs and sockets (see parts layout). The four antenna sockets are secured using self-tapping screws.

The PC board can now be installed in the case, copper side up, and the leads connected to the plugs and sockets using right angle bends (see photograph). Note the earth-loop for the 4-pole plug. This should be installed to ensure adequate shielding of the control cable.

Next, prepare four equal lengths of coaxial cable (70-100cm) and solder the line plugs to one end of each cable. These are used to connect the four antennas to the switching box.

Diodes D205-D208 are each mounted on the antenna bases which are supplied with the kit. These diodes and the coaxial cables are terminated using extra double-ended solder lugs which have also been included. The procedure is as follows:

First, solder the inner connection of the coax and the anode of the diode to the existing lug on the antenna base. This done, secure the double-ended lug to the ground-plane connection on the base of the antenna with a small self-tapping screw. Finally, solder the braid of the coax to one side of the lug and the diode cathode to the other.

Repeat this procedure for the remaining cables.

Connections between the ASU and the control unit should be run using 4-core cable, while the connection to the FM receiver should be run using coaxial cable. All you have to do is trim the cables to the desired lengths and terminate them with the appropriate plugs.

Note that the wiring connections to the plugs at both ends of the control

Radio Direction Finding: The Classic Technique

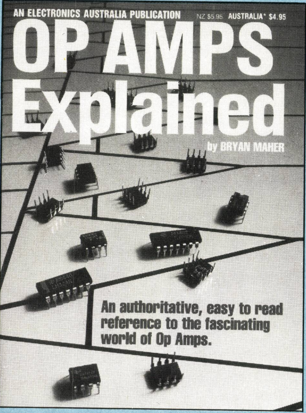
Most readers will be broadly familiar with the concept of a radio direction finder. In its most basic form, it consists of a receiver and an antenna which can be rotated on its own axis. The direction of the transmitter is then found by rotating the antenna for a signal peak or null.

You can easily demonstrate the effect for yourself using a portable transistor radio fitted with a ferrite rod antenna. By tuning the radio to a station and rotating the radio about its vertical axis, a null will be found in the signal strength. The ferrite rod antenna will then point in the direction of the station.

Of course, this method requires that "fixes" be taken at two or more widely spaced locations in order to find the true direction of the transmitter. In fact, two fixes enables the exact location of the transmitter to be determined by simple triangulation.

The classic application of this radio direction finding (RDF) technique was in World War II. Many war movies showed how it was possible to track down enemy transmitters using special vans fitted with RDF equipment.

Typically, these vans were fitted with a large external loop antenna which could be manually rotated. An operator inside the van listened in on headphones for peaks and dips in the signal strength. Provided the transmitter remained in the one location for long enough, its location could eventually be pinpointed.


AN ELECTRONICS AUSTRALIA PUBLICATION NZ $5.95 AUSTRALIA* $4.95

OP AMPS Explained

by BRYAN MAHER

An authoritative, easy to read reference to the fascinating world of Op Amps.

NOW IN BOOK FORM

Look inside almost any piece of modern electronic equipment (even things that are normally "digital") and you're likely to find op amps amplifying, filtering, shaping, clipping, detecting level changes or otherwise processing signals.

Without op amps, we'd still be in the electronic dark ages. And without sound basic understanding of the way they work and the way they're used, you probably won't get very far in today's world of electronics.

This book can be your guide and reference. It is authoritative, but at the same time very accessible and easy to read. The author has really boiled down the concepts of op-amp operation to make them understandable.

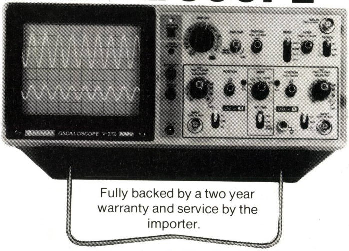
Recommended to all interested in linear electronics, operational amplifiers and their applications whether at hobby level or as a serious University or College student.

ON SALE AT YOUR LOCAL NEWSAGENT

Also available from:
FEDERAL MARKETING BOOK SALES, PO BOX 227, WATERLOO, NSW 2017.

Price: $4.95 plus $2.25 pcp.

BUY DIRECT & SAVE ON *SLIMLINE* HITACHI 20MHz SCOPE



Fully backed by a two year warranty and service by the importer.

$599 ex tax
$702.14 inc tax

- ***Slim - only 310 x 130 x 370mm - and just 6kg***
- ***Vertical mode triggering for stable traces***
- ***150mm internal graticule CRT***
- ***1mV-5V/div sensitivity***
- ***20MHz bandwidth with 17nS risetime***
- ***Hitachi quality engineering***
- ***FREE comprehensive manual***

Prices subject to change without notice.

bankcard MasterCard

irh COMPONENTS
SYDNEY: 32 Parramatta Road,
Lidcombe 2141. Tel: (02) 648 5455
TLX AA24949 FAX (02) 647 1545

USE COUPON TO ORDER

PLEASE SUPPLY

V212 Scope Sales Tax Number quoted (Sales Tax No: ....)	$599 ex tax	$..........
V 212 Scope including sales tax	$702.14 inc tax	$..........
Two Coline SP100 switched 100MHz probes	$54 pair	$..........
55 page Operation Manual with circuit		$ FREE
133 page Detailed Service Manual	$33	$..........
Rugged Plastic Front Cover	$25.20	$..........
Packing Insurance & Delivery within Australia		$ 10.00
	TOTAL	$..........

Pay by Cheque/Bankcard/Mastercard

Credit Card Number .... Expires .../.../...

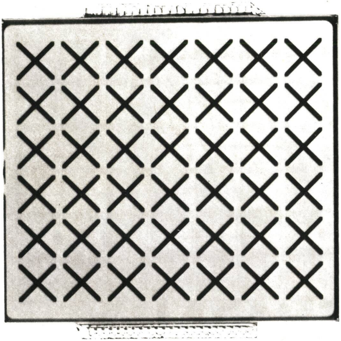
Signature ....

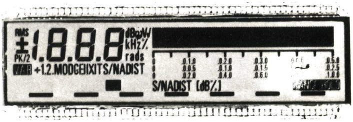
Name..

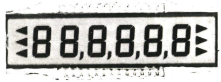
Address ....

.... Postcode....................

THINKING OF CUSTOM LCD'S?





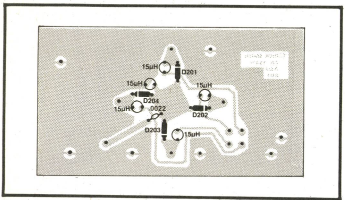


THEY ARE VERY ECONOMICAL AND DELIVERY FOR FULL CUSTOM IS 4 WEEKS!

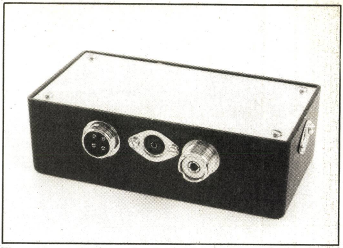
FOR CATALOGS & FURTHER DETAILS CALL

Promark Electronics PTY. LTD.
(inc N.S.W.)

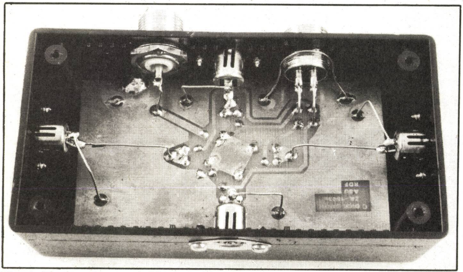
SYDNEY	MELBOURNE	TOLL FREE
(02) 439 6477	(03) 878 1255	(008) 22 6226



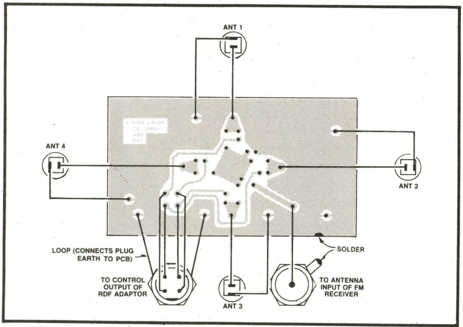
Parts layout for the antenna switching unit. The diodes are all BA244 types.



The antenna switching unit is housed in a plastic zippy case. It can be weatherproofed using silicone sealant.



View inside the antenna switching unit. Note the earth loop for the 4-way socket.


ANT 1
ANT 4
ANT 2
LOOP (CONNECTS PLUG EARTH TO PCB)
SOLDER
TO CONTROL OUTPUT OF RDF ADAPTOR
TO ANTENNA INPUT OF FM RECEIVER
ANT 3

The sockets are connected to the copper side of the PC board using tinned copper wire.

cable must be made on a one-to-one basis, otherwise the antennas will not rotate in the correct sequence.

Setting up

An alligator clip lead and a small screwdriver are all that are necessary to adjust the unit.

Connect up a 12V supply (be careful of polarity!) and switch on with the hold off and the ASU disconnected. All the LEDs in the display should rapidly flicker on and off as the display is scanned.

Assuming all is well, connect the two test points (TPA and TPB) together using the clip lead and adjust VR1 until a single LED is latched. Confirm this adjustment by unhooking and reconnecting the clip lead.

If the display does not latch when the test lead is reconnected, repeat the above procedure. This adjustment brings the VCO to within the capture range of the PLL.

Note that, with the calibrate control at mid-position, the latched LED should be at the top of the circle.

If a dual-trace oscilloscope is available, VR1 can be adjusted for a 90° phase angle between the signal input (pin 14, IC14) and the PLL comparator input (pin 3, IC14).

Finally, the control unit can be checked out by connecting outputs 1, 2, 3 & 4 (to the ASU) in sequence to test point TPA. First, connect ouput 1 to TPA and adjust the calibrate control so that the latched LED is at 0°. The 90° LED should now light when output 2 is shorted, the 180° LED when output 3 is shorted, and the 270° LED when output 4 is shorted.

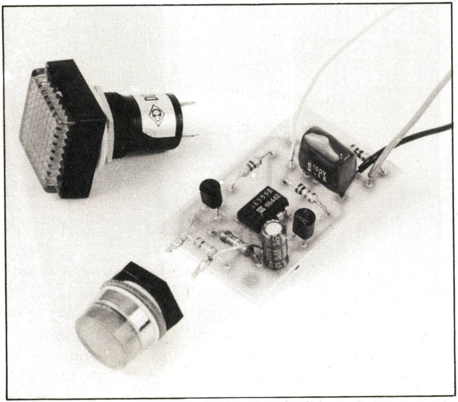
That completes the construction. Your Radio Direction Finder is now ready for use.

Scare off car burglars . . .

Fit this flasher to your dashboard

This is a "Claytons" car burglar alarm — the alarm you connect when you can't be bothered fitting a proper alarm. There is no siren or detection circuit. It simply flashes a light on the dashboard.

by COLIN DAWSON



This view shows the assembled PC board and two lamp bezels (see text).

Sales of car burglar alarms have boomed in recent years. With the poor level of security offered by most cars, and the willingness of many repair shops to buy spare parts with a doubtful background, car thieving has become a growth industry.

Paradoxically, the person most likely to be inconvenienced by a car burglar alarm is the driver. From the moment it is fitted, the hapless motorist is haunted by every alarm in the neighbourhood. In addition, there is the inconvenience of having to enter and exit the car within a specified time.

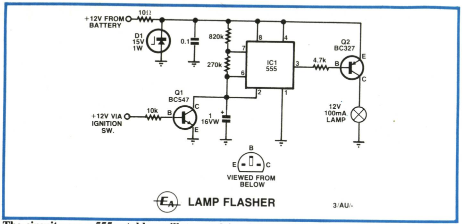
Much of the inconvenience of an alarm can be avoided with a fake alarm. One of the most effective deterrents of any alarm circuit — even the most sophisticated — is the flashing light on the dashboard.

In fact, many car owners have been quick to realise this and have simply fit-

PARTS LIST

1 PC board, code 86au1, 29 x 46mm
1 555 timer IC
1 BC547 NPN transistor
1 BC327 PNP transistor
1 15V 1W zener diode
1 10μF 16VW electrolytic capacitor
1 0.1μF greencap
1 12V lamp bezel (see text)

Resistors (0.25W, 5%)
1 x 820kΩ, 1 270kΩ, 1 x 10kΩ, 1 x 4.7kΩ, 1 x 10Ω/0.5W



The circuit uses a 555 astable oscillator to drive Q2 and the lamp.

ted an authentic-looking flashing light in the place of a real alarm. These are generally purchased from motor accessory shops for around $20.

This type of "Clayton's" alarm has a few advantages. First, it never false alarms during the middle of the night. Second, the driver doesn't have to worry about making a frantic dash for the kill switch upon entering the car. And third, it is far cheaper and easier to install than a real alarm.

By contrast with the commercial units, this unit can be built for around $10 (depending on the lamp used). Once installed, you need never worry about the flasher again. It automatically starts when you switch the ignition off.

The project would be most effective when used with a proper red or yellow square 12V bezel as per the commercial devices. These can be purchased from automotive accessory shops.

Alternatively, most of the kitset suppliers carry round 12V lamp bezels which would still look fairly convincing, particularly if you fit a couple of warning stickers as well.

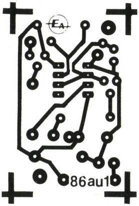
Don't buy a combined switch and bezel — they're too expensive.

Circuit description

The circuit is based on a 555 timer IC. Its configuration in this instance is quite typical, the device being wired as an astable oscillator. This means that it oscillates, with its output (pin 3) going alternately high and low whenever the IC is enabled.

The rate of flashing is controlled by three components: the 820kΩ and 270Ω resistors, and the 1μF capacitor. With these component values, the rate will be about one flash per second. The simplest way to adjust the rate is to alter the value of the 820kΩ resistor.

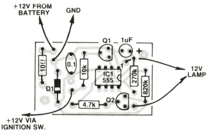
The enabling aspect of this circuit is somewhat unconventional. During normal operation, pin 2 of the 555 will oscillate between 1/3 and 2/3 of the supply voltage. Clamping it to any fixed voltage inhibits astable operation.



Here is an actual-size artwork of the PC board. It measure 29 x 46mm.

This function is controlled by transistor Q1 and the ignition switch. When the ignition is switched on, transistor Q1 is biased on and clamps pin 2 to ground. This disables the 555 timer and turns the lamp off.

When the ignition is switched off, Q1 turns off and releases its clamp on pin 2. The 555 immediately begins oscillating, its output (pin 3) switching high and low. This drives transistor Q2 which, in turn, drives the lamp.



Parts layout for the lamp flasher. Take care with component orientation.

Power for the circuit is derived directly from the car battery. A 10Ω resistor and 0.1μF capacitor provide supply decoupling while the zener diode clips any voltage spikes exceeding 15V.

Construction

The parts are all mounted on a small PC board measuring 29 x 46mm and coded 86au1. No special order need be followed when assembling the board, but take care to ensure correct orientation of the polarised components.

These include the IC, transistors, zener diode and 1μF electrolytic capacitor.

Once the board has been assembled, it can be tested by connecting the power leads to a car battery. The lamp should immediately begin flashing at a 1Hz rate. The lamp should stop flashing when the input to the 10kΩ resistor is connected to +12V.

Incidentally, we purchased our lamp bezel from RS Components, Unit C, 6 Durdans Avenue, Rosebery NSW. This is a round 14mm bezel and is available for $5.10 (price includes five light bulbs). Alternatively, a larger square lamp bezel (20 x 20mm) is available from Hi-Com Unitronics (7 President Avenue, Caringbah, NSW) for just $1.20.

Installation is straightforward. There's no need to fit the circuit into a case. The best approach is to wrap the board in insulating foam and then tape it in some convenient location behind the dashboard.

The external wiring connections should be run using medium-duty hookup wire. Connections must be made to the power supply, the lamp and the ignition switch.

Note that the latter connection need not be made directly to the switch — it could just as easily be taken from an accessory switch or some accessible point on the ignition wiring. Similarly, the +12V supply rail can also be derived from under the dashboard (eg, from a glovebox light switch terminal or from the headlight switch).

Finally, although the circuit is designed to operate automatically, some constructors may prefer to manually switch it on and off. No problem — just install a switch in the power supply lead and connect the input to the 10kΩ resistor to chassis.

In fact, the 10kΩ resistor and Q1 could be left out of the circuit altogether. It goes without saying that any power supply switch should be well hidden.

Our computers fly at t
and so do our co

If a Navigator Tactician looks at his watch, you can bet he's not counting the minutes till lunch.

There is no more exciting job than his in the world of computers. If not the world.

The Navigator Tactician's computers have wings.

Some also have more than 18,000 pounds of thrust behind them.

He interfaces with computers that run the aircraft's navigation programs, weapons guidance systems, electronic counter-measures and communications.

Like the Pilot, the Navigator Tactician is also an expert on avionics, the theory of flight, physics.

He's a key member of a tight-knit team called Aircrew.

Together, the Pilot and Navigator Tactician could be flying strike/reconnaissance sorties in high-performance F111s.

Guiding P3C Orion Maritime Patrol Aircraft

wice the speed of sound
mputer operators.

on anti-submarine and surveillance exercises.

Or leading a Hercules, carrying vital supplies to civilians isolated by raging flood waters.

To apply, you must be at least 17 and under 27. You must have completed Year 12, with passes in specific subjects.

You must also be an Australian citizen.*

If you meet our selection requirements, you could be in the air within the year. Flying your computer.

*Or eligible to become one.

Send off this coupon now to find out more about your career as an RAAF Navigator Tactician.
To: RAAF Careers, GPO Box XYZ (in the Capital City nearest you).
Name ______________________________
Address ______________________________
______________________________ Postcode ____________
Date of Birth ______________________ Highest Educ. level
attained ______________ or being studied ______________
Or phone an RAAF Careers Adviser on Adelaide 212 1455. Brisbane 226 2626. Canberra 82 2333. Geelong 21 1588. Hobart 34 7077. Launceston 31 1005. Melbourne 697 9755. Newcastle 26 3011. Parramatta 635 1511. Perth 325 6222. Sydney 219 5555. Townsville 72 4566. Wollongong 28 1855.

NAVIGATOR

Authorised by Director-General of Recruiting, Dept. of Defence. AFAC 104.DPS.95

AM3

The walkabout radio

Most miniature AM radios compromise on sound quality but you'll be surprised how good this one sounds. It's a "Walkman" style unit that comes as a kit of parts, ready for easy assembly.

by STEVE PAYOR and DAVID WHITBY

Despite the availability of very cheap commercially manufactured receivers, many people still prefer the satisfaction of building their own, even if the results may not be quite as good as a "bought one".

However, this new circuit, which we have dubbed the AM-3, has a performance for which no apologies are necessary. When fitted in the optional dark brown case, with a precision vernier tuning dial, it has a solid look and a feeling of quality. The sound quality is also excellent — equal to any "Walkman" style portable.

Tuning with the vernier dial is infinitely easier than with the plastic thumbwheel normally found on AM pocket radios.

Building this radio will also save you money on batteries. It requires only a single 1.5V AA cell, and the current drain is so low (only a few milliamps) that the continuous battery life will be measured in months, instead of hours as it often is for a normal 9V transistor radio.

The AM-3 is available as a complete kit of parts from Technicraft Electronics, which saves the effort normally spent in locating the specialized parts such as the ferrite rod and tuning capacitor, not to mention all the "fiddly bits" like screws, spacers etc. High quality components are supplied throughout, including a tinned fibreglass printed circuit (PC) board.

Construction is a "breeze" — all components, including the tuning and gain controls, ferrite rod aerial, battery and headphone socket, are mounted on the PC board. You can build it in this "short" form, then simply drop it into the optional case. The case is supplied with attractive, silk-screened gold lettering and is pre-drilled, so no special tools are needed for a "professional" finish.

Quality lightweight headphones will be made available with either the "short form" or complete kit. Alternatively, you can use any existing type of headphone if you already have a pair.

The circuit is based on the Ferranti ZN414 "radio-on-a-chip" integrated circuit. Previous builders of small radios using this IC will have noticed some shortcomings in its performance: in particular its limited "strong" signal handling capability, and the need for an audio transformer for driving low impedance "hifi" type headphones. The volume level is also inadequate for noisy environments.

These problems have all been rectified in this latest design. An "RF GAIN" control has been added to the basic circuit, which enables the ZN414 to be adjusted for optimum reception of signals of any strength.

A one-transistor audio amplifier has also been added to eliminate any complaints about the volume level.

The AM-3 delivers good quality sound into a pair of headphones.

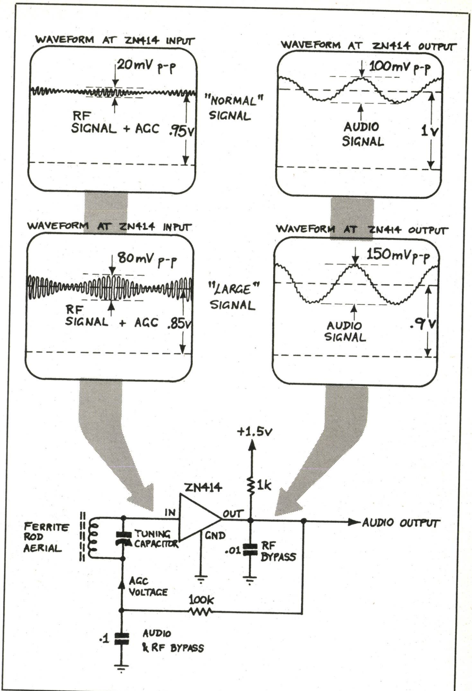


Fig.1: basic ZN414 circuit showing typical waveforms for various signal conditions.

The ZN414: basic circuit

The ZN414 forms the heart of the circuit. When fed with the signal picked up by a small ferrite rod aerial, it performs all the necessary functions of radio-frequency amplification and demodulation, to produce an audio output sufficient to drive most headphones directly at a modest volume.

Internally, its operation is fairly complicated, but this need not concern us. We can simply view it as a "black box" which produces an output current which is linearly proportional to the amplitude of the RF input.

Physically, it looks like a standard 3-pin transistor package. Normally we would expect an IC to have at least four external connections: IN, OUT, GND and V+. The ZN414 makes do with only three pins by combining the function of power supply and output.

How it achieves this is interesting. In essence, the IC varies its supply current a small amount in proportion to the amplitude of the incoming signal. Thus, by feeding the power to the "output" pin through a 1kΩ resistor, there will be a small AC voltage developed across this load which follows the amplitude variations of the incoming signal.

This is the demodulated audio we are looking for, although it is necessarily rather small, as the "output" pin voltage cannot be allowed to fluctuate too much, since the rest of the circuit derives its power from this point. An audio amplifier is needed for anything more than "headphone listening" sound levels.

Besides RF amplification and demodulation, all "serious" radio receivers also include some form of *A*utomatic *G*ain *C*ontrol (AGC). This is essential as the amplitude of signals from various stations (some close by, others further away) can vary from 10μV to 100mV or more. Without AGC, nearby stations would overload the receiver, giving a harshly distorted output, while distant stations would be barely audible.

The normal ZN414 circuit implements a moderate amount of automatic gain control by feeding the *average* DC voltage at the output back to the input, where the gain is strongly affected by changes in DC bias. When a signal is received, the average voltage at the output drops slightly, and consequently the DC input voltage is reduced, which tends to "turn off" the radio frequency amplifier, reducing the overall gain.

Actual measured voltages for a typical circuit are shown in Fig.1. Notice that the AGC voltage is roughly equal to the output voltage, with any audio or radio-frequency signals removed by the low pass filter formed by the 100kΩ resistor and 0.1μF capacitor. Waveforms are shown for a "normal" signal level (one which just gives full output), and a "large" signal (at the point of output distortion). For a four times increase in signal input, the output only increases 50%. This amount of control is achieved with an AGC voltage variation of 0.1V.

Unfortunately, this amount of gain control, although useful, is not really adequate. By comparison, a well-designed six or seven-transistor AM radio receiver will cope with a 1000:1 range in signal voltage without overloading.

In the past, builders of ZN414 radios have managed to live with this limited amount of AGC by either adjusting the nominal 1kΩ load resistor to vary the control voltage range, or by rotating the ferrite rod aerial to reduce the signal pickup from strong stations. Many designs even resorted to using the smallest possible ferrite rod, in order to keep the signals "weak".

All these methods work to some degree, but the authors have developed an improved circuit which overcomes this problem and offers some additional bonuses.

Improved circuit

Fig.2 shows an RF GAIN control added to the basic circuit, which allows manual adjustment of the AGC voltage. (RF GAIN controls are normally only found on receivers used by amateur radio operators, who, by the nature of their hobby, like to get the utmost out of their receivers, whether communicating half way round the world, or just across town).

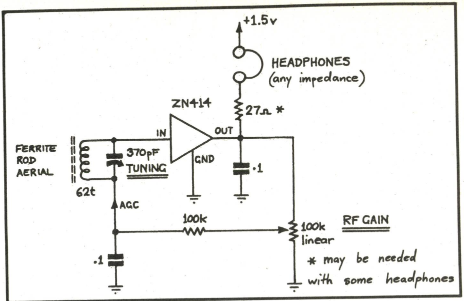


Fig.2: improved ZN414 circuit with RF Gain control.

When receiving strong signals with this circuit, one simply "backs off" the RF GAIN control a little until the signal is clear and undistorted. The fidelity of the signal with the correct gain setting is excellent, especially with a good pair of wide-range headphones. The audio quality has to be heard to be believed!

Reducing the gain too much will drop the volume and cause some distortion, and ultimately silence as the input passes from partial to complete "cut-off". Increasing the gain too much will also result in distortion, and sometimes complete silence on very strong signals, because the ZN414 output stage will be completely "saturated".

On weak signals, the control is advanced to the point where the input just starts to draw appreciable current. This gives the maximum possible gain for receiving distant stations.

You can tell if the control has been advanced too far, as the tuning will become quite broad, and stations will merge together. This is because the input impedance of the ZN414 drops as the input starts to draw current, and the normally sharp response of the tuned circuit becomes progressively damped. The most sensitive point is just before this happens.

All this may sound a little involved, but in practice the correct setting of the

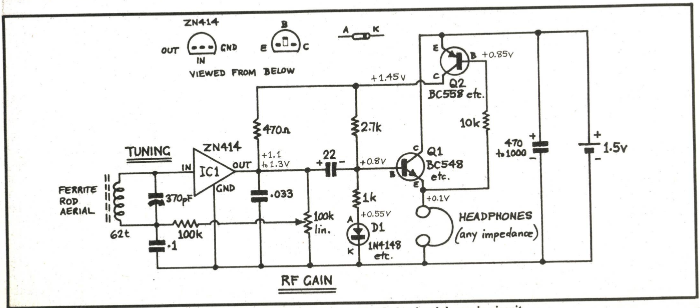
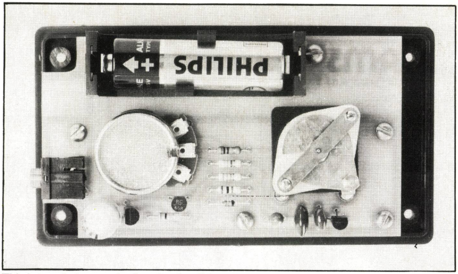
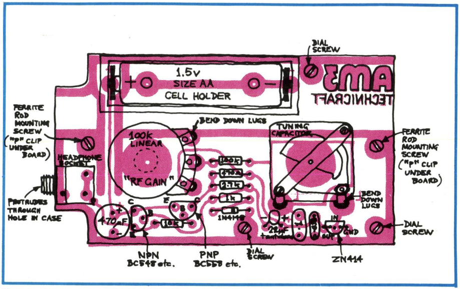


Fig.3: the final circuit for the AM-3 radio. The voltages marked are with 15-ohm headphones in circuit.



This internal view emphasises the simplicity of the AM-3.



Follow this parts layout diagram when installing components on the PC board.

gain control is easily found, and this slight added complication is well worth the following benefits:

Firstly, distortion is easily minimized, and the sound quality approaches that of the best wideband AM tuners.

Secondly, the 1kΩ load resistor is no longer critical, and the circuit, as it stands, will accept any load between 20Ω and 1.5kΩ. This means that almost any pair of headphones can be used directly, with no real need for the usual output transformer to match impedances.

Even with low-impedance "hifi" headphones, the output is better than that obtained using a 1kΩ load resistor and an audio transformer, and the frequency response is limited only by the headphones.

A further spin-off is the fact that simply un-plugging the phones turns off the circuit — no battery switch is needed.

Finally, this circuit is quite tolerant of falling battery voltages. With low-impedance phones, the battery voltage can drop to as low as IV before you run out of adjustment with the RF GAIN control.

The AM-3: circuit description

The ultimate development of this simple circuit is Fig.3. Here we have added a one-transistor audio amplifier to boost the output to a level sufficient to drive even the most insensitive of modern high-fidelity headphones.

The "auto-power-off" facility has been retained by using an additional transistor to "disconnect" the power to the ZN414 and the audio amplifier when the headphones are unplugged.

RF section: The load for the ZN414 has been set at 470Ω, which is large enough to allow a fair amount of normal AGC action, but small enough to feed sufficient current to the ZN414 under low-battery conditions. With this load, the RF GAIN control will need manual adjustment on only the strongest stations.

The exact value of the gain control potentiometer is not critical — any value from 20kΩ to 200kΩ will do. From here the AGC voltage is filtered by the 100kΩ resistor and 0.1μF capacitor before being applied to the "cold" side of the aerial tuned circuit.

At the ZN414 output, a .033μF capacitor bypasses any RF signals, while a 22μF capacitor couples the audio signal to the output stage.

Audio amplifier: This consists of NPN transistor Q1 which "buffers" the output from the ZN414. An emitter-follower configuration is used here, as we only need to amplify the current (not the voltage) of the audio signal. Class "A" operation is achieved by setting the base voltage to approximately 0.8V, which results in a DC voltage across the load of about 0.1V, which is slightly more than the peak AC signal amplitude.

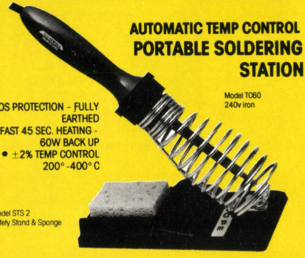
Q1's base voltage is derived from the voltage divider formed by the 2.7kΩ and 1kΩ resistors, added to the voltage drop across the forward-biased silicon

A kit of parts for this project is available from Technicraft Electronics, 338 Katoomba St, Katoomba, NSW 2780. Phone (047) 82 3418.
Two versions of the kit are available:
(1.) A short form kit: all parts except the vernier dial and case. Price $14.50.
(2.) The full kit: all parts including the vernier dial and case. Price $24.50.
In addition, quality lightweight headphones are available for $7.50 per pair.
Add $3.00 for postage and packing to all orders.

SCOPE

SPECIALISED TOOLS TO SUIT YOUR JOB

AUTOMATIC TEMP CONTROL PORTABLE SOLDERING STATION



Model TC60
240v iron

- CMOS PROTECTION – FULLY EARTHED
- FAST 45 SEC. HEATING - 60W BACK UP
- ±2% TEMP CONTROL 200°-400° C

Model STS 2
Safety Stand & Sponge

NON TEMP CONTROL PRODUCTION QUALITY 20W IRON

Model PH20
240V iron 370°C

- COMFORTABLE AIR COOLED FINGER GRIP
- CMOS PROTECTION – FULLY EARTHED
- LONG LIFE IRON PLATED TIP RANGE

Model STS2
Safety Stand & Sponge

SELF CLEAN TIP – METAL BODY

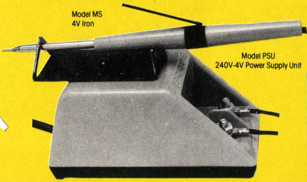
- CRUSH PROOF METAL BODY
- TIP SELF CLEANS EVERY CYCLE
- NEOPRENE "O" RING FOR ACCURATE SEAL

Model SR
Solder Remover

Model SN
Replacement Nozzle

MANUAL TEMP. CONTROL ADJUSTABLE 10W⟷70W SOLDERING SYSTEM

- YOUR FINGER ADJUSTS WATTAGE & TEMP. 200°⟷500° C
- MULTI PURPOSE ADJUSTABLE SERVICE IRON
- FAST 5 SEC HEAT FOR MAINTENANCE & REPAIR WORK

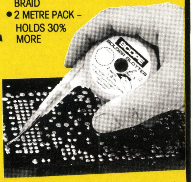


Model MS
4V Iron

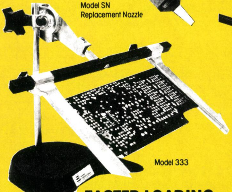
Model PSU
240V-4V Power Supply Unit

DISPENSER KEEPS FINGERS COOL

- POSITIONS BRAID MORE ACCURATELY
- REDUCED RISK OF BURNT FINGERS
- DISPENSER WINDS BACK SURPLUS BRAID
- 2 METRE PACK – HOLDS 30% MORE



Model SB3



Model 333

FASTER LOADING – FIRMER LOCKING

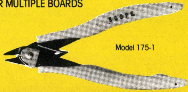
- SPRING LOADED ARMS SAVE LOADING TIME
- LOCKS FIRMLY IN 32 POSITIONS
- ACCEPTS SINGLE OR MULTIPLE BOARDS

BUILT LIKE PLIERS – FINE LIKE TWEEZERS

- THIN PROFILE 25mm RIGID JAWS
- SERRATED JAWS
- CUSHION PVC GRIP

Model 378

FLUSH TYPE PCB SIDE CUTTERS RADICAL SCISSOR ACTION



Model 175-1

- SAFETY 'OFFCUT' CATCHER OPTION
- SMALL NARROW BLADES FOR TIGHT CORNERS
- SCISSOR ACTION REDUCES CUTTING EFFORT

For a
FREE CATALOGUE

send your name
and address to :

FREEPOST No. 2
SCOPE LABORATORIES
P.O. BOX 63
NIDDRIE, VIC., 3042

NO STAMP REQUIRED

SCOPE
(03) 338 1566

SEND FOR FREE CATALOGUE

AM3

diode D1. This diode provides a voltage which matches the temperature variations of the emitter-base voltage of Q1. Without D1, the voltage across the headphones would increase excessively if the AM-3 was left out in the sun.

"Power-up" circuit: When a load is plugged into the output, current flows through the $10k\Omega$ resistor, turning on PNP transistor Q2. This applies bias voltage to the NPN audio output stage, and the supply voltage for the ZN414, to within about 50mV of the full battery voltage. With no load, Q2 stays "off" — the only current flowing is a few nanoamps of leakage.

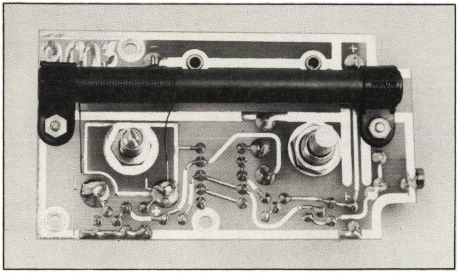
Finally, a $470\mu F$ to $1000\mu F$ capacitor bypasses any internal resistance the battery may develop as it nears the end of its life.

Construction

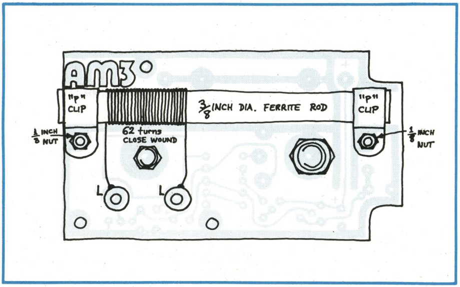
All components are mounted on a single fibreglass PC board. The potentiometer and tuning capacitor are mounted on the component side of the board, and their lugs bent down to protrude through to the track side of the board.

The battery holder and headphone socket also reside on the component side, while the ferrite rod is mounted on the track side. Leave this till last.

When fitting the smaller components, be sure to check the wiring diagram to ensure correct orientation of transistors Q1 and Q2, the diode D1, and the ZN414 (IC1). Check also that the two electrolytic capacitors are the right way around.



The ferrite rod antenna is mounted on the copper side of the board.



Solder the antenna leads to the two points marked "L" (see also above photo).

The aerial coil consists of 62 turns of 0.4mm (26 B&S) enamelled copper wire. This can be wound directly on the ferrite rod if you first remove any sharp edges with some fine abrasive paper. Alternatively, use a single layer of sticky tape under the winding.

Wind neatly and carefully in the direction shown in the wiring diagram, and secure the ends of the coil with sticky tape or two small dots of "super glue". The ends of the winding may now be stripped of enamel and tinned, ready for soldering.

This done, the ferrite rod can be mounted on the solder side of the board with two plastic "P" clips. Check the wiring diagram for the correct way around to connect the coil. Why should this matter? Read on . . .

Troubleshooting Note: (this is a general hint for any circuit using the ZN414 IC). Since the ferrite rod is such a good inductive pickup for radio signals, it also follows that any RF current flowing in the output circuit will also be picked up by the aerial circuit — this is unavoidable. There is a 50:50 chance that this will lead to instability and oscillation (depending on whether the feedback is positive or negative).

Evidence of instability includes whistles and bursts of severe distortion when the RF GAIN control is advanced.

There is no need to panic — the cure is simple. Simply reverse the connections to the aerial coil. If you stick to the circuit layout as described, and wind the coil in the direction shown, all should be well the first time around.

Having soldered the coil leads to the two pads marked "L", the AM-3 is now ready for the "smoke" test.

Initial testing

Temporarily fit the knobs to the tuning and gain controls, turn the gain right up, and set the tuning capacitor to half mesh. Insert a battery, and plug in the headphones — you should hear something at this point.

If not, try the tuning, and if there is still no sound, disconnect the battery and check the circuit carefully. It would be wise to check the current consumption at this point.

Start with the headphones unplugged, and connect up a multimeter in series with the battery. A brief surge of current will flow as the $470\mu F$ capacitor charges up, followed by nothing. When the headphones are plugged in, the current consumption should be between 3mA and 7mA (depending on the headphone resistance), and the maximum current with a short-circuit load should be about 10mA.

Final assembly

Assuming all is well, you may now fit the board into the case. This is delightfully easy. First, position the two tapped spacers on the bottom dial screws, and the single clearance spacer behind the top of the dial. Line up the extension shaft on the tuning capacitor with the dial bush, and seat the board on the spacers. Two short screws anchor the board to the tapped spacers, whilst one long screw goes through the top clearance spacer into the back of the dial housing.

Set the tuning dial to "0", the capacitor plates to full mesh, tighten the grub screw in the dial bush, and that's it!

When the case is assembled, the headphone socket should nestle snugly in the hole in the side of the case. Additional support for the circuit board is provided by the internal ledges against which it firmly rests. The whole assembly is impressively rugged, and should literally last a lifetime.

Performance

In overall performance the AM-3 is one of the best "beginners" radios ever published. On local stations the sound is loud, and completely free of audible distortion. In fact, the major limiting factor seems to be the audio quality of the program material transmitted by most broadcast stations.

Selectivity is not as sharp as a conventional "superhet" receiver (with its multitude of fixed-tuned circuits), but, on the plus side, it means that no loss of treble results from the tuning being too sharp. The selectivity is adequate even for the Sydney area, where some stations are less than 50kHz apart, while the sensitivity is sufficient to pick up some country stations.

When tested at Katoomba, in the Blue Mountains 100km west of Sydney, all the stations were received quite clearly, and many interstate stations were received at night.

The directional aerial and direction finding

In the "good old days" of broadcasting, all the best 8-valve superhets used a loop aerial. This was simply a large, square tuning coil, up to a metre across, which picked up signals by virtue of the magnetic field of the electromagnetic radiation passing through the loop.

Compared with a normal aerial and earth system (which responds to the electric field component of the radiation), these loop aerials had the advantage of being directional, and could be rotated to pick up the maximum signal from a wanted station, or to minimise the interference from an unwanted one. Signal pickup was proportional to the area of the loop, and consequently they were quite large, but then so were the old valve radios.

All this changed with the invention of transistors and ferrite. Both the radio and its aerial shrunk to pocket size. A miniature tuning coil wound on a rod of ferrite will pick up almost as much signal as a loop aerial. Ferrite has a magnetic permeability many times that of air, and so magnetic fields on the vicinity of the rod are "conducted" through the centre of the coil. Signal pickup is proportional to the length of the rod.

The ferrite rod aerial is sharply directional, just like its ancestor, and the AM-3 uses this to advantage. If you live very close to a powerful station, and wish to receive a distant station which is on a nearby frequency, just rotate the radio (in a horizontal plane) until the interfering signal is "nulled". This will occur when the ferrite rod is at right angles to the incoming magnetic field: ie. when the rod is pointed directly at the source.

This property can be used for direction finding, and triangulation of your position. To do this you will need a compass, and a map with the locations of two or more broadcasting stations marked on it. Air and/or marine navigation charts are best for this purpose.

Attach a plastic ruler to the bottom of the AM-3 case with sticky tape, and check that it is parallel to the internal ferrite rod. Align the map in a north-south direction using the compass. (Most maps have the direction of "magnetic north" clearly marked).

Now place the AM-3 with the ruler on the map and rotate it for a complete null on a selected station. Use the ruler to draw a pencil line from the station location to your estimated position. Do this a few more times with different stations and the intersection of the lines on the map will indicate your position.

Note that longer wavelength stations are more useful as the radiation is less affected by diffraction and reflection from mountains, city buildings etc.

Other Frequency Bands

In fact, a whole band of frequencies below the broadcast band has been set aside specifically for this purpose. Most airports have NDBs (Non-Directional Beacons) which provide voice information about weather conditions etc. (Refer to the article "Weather Radio For Pilots", EA July 1985, for a list of frequencies and locations of airport NDBs).

To tune this low-frequency band, you will need to wind the ferrite rod with 200 turns of 0.25mm enamelled copper wire. On the prototype, this gave a tuning range of 175kHz to 850kHz.

The recommended winding to cover the broadcast band (531-1602kHz) is 62 turns of 0.4mm wire. On the prototype this gave a tuning range from 525kHz to above 2MHz. Less turns can be used if you are interested in reception on higher frequencies. Sydney listeners will be able to tune to VL2UV (University of New South Wales) on 1692kHz.

The ZN414 is designed to work at frequencies up to 3MHz, and individual devices may work at even higher frequencies, although the ferrite rod will start to become a bit "lossy" above this range.

Nevertheless, the AM-3 is perfectly usable for listening in on the lower frequency short-wave amateur bands. Readers can experiment by reducing the number of turns on the ferrite rod a little at a time until they have the desired frequency coverage. Sufficient wire is provided in the kit to wind several coils.

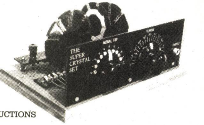
TECHNICRAFT SUPERB QUALITY KITSETS

FROM THE 1920's

EXCITING VINTAGE RADIO KITSETS! FULLY WORKING RECEIVERS WITH ALL THE POLISHED WOOD, BAKELITE AND BRASS APPEAL OF THE PIONEERING DAYS OF "WIRELESS".

THE SETS ARE A PLEASURE TO BUILD & USE AND ALSO MAKE SUPERB DISPLAY ITEMS.
NOW EXPORTED TO 6 COUNTRIES

THE SUPER CRYSTAL SET



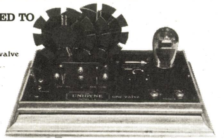
ALL PARTS AND FULL INSTRUCTIONS

KIT $79.50
FULLY BUILT $119.00
P & P $7.00

For aerial kit and headphones, see below.

Built to 1920's Navy circuits. The ultimate in crystal set performance. (One constructor has reported reception over 1500km with this set.) Original type "SPIDERWEB" coils, brass stud switch, Bakelite panel and high quality wooden base.

the UNIDYNE MODEL 1A one valve

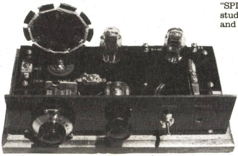


Our original and most popular kit. Over 300 have now been built by enthusiasts around the world. It has been praised both for its appearance and performance. Powered by easy to get batteries. Remaining stocks of the early valve and other parts used in this kit make it definitely a LIMITED EDITION.

KIT $99.00
FULLY BUILT $150.00
P & P $7.00

ALL PARTS AND FULL INSTRUCTIONS

The kitsets come with fully finished Bakelite panels and woodwork. You need only to follow the easy assembly and wiring instructions to complete your kit. Fully built sets are tested and ready to operate.

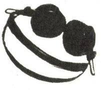


the Reinartz 2

Tune into the world with this two valve all-wave set. Using the famous REINARTZ circuit (introduced in 1922) and featuring plug-in "spiderweb" coils (3 in the kit) and genuine early valves. Also a Limited Edition. May be powered by a battery pack or the power supply (P.S.A.1) shown below.

KIT $105.00
FULLY BUILT $159.00 P & P $7.00
ALL PARTS AND FULL INSTRUCTIONS

HEADPHONES — these are required for each kit. If you do not have your own we have available early-type 'phones which complement the vintage designs perfectly.



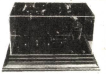
STC 3400 Ω SENSITIVE AND RUGGED $19.50.
P & P $2.00

P.S.A.1
A & B SUPPLY WITH AUDIO AMP & SPEAKER
$47.00. P & P $2.00
(includes 9V-AC plugpak)

PERSPEX DISPLAY COVERS

These give the sets a real "Museum Piece" appearance as well as protecting them from dust.

$24.50
P & P $2.00



The Unidyne shown with cover

ALSO VALVES, COILS, CRYSTAL DETECTORS, DIODES, TUNING CAPACITORS, RHEOSTATS, POTS LOW IMPEDANCE 'PHONES, KNOBS, TERMINALS, SOCKETS, IN FACT, ALMOST EVERYTHING YOU MAY NEED TO RECREATE THAT OLD-TIME CIRCUIT. SEND $2.00 FOR CATALOGUE

TO THE 1980's

DESIGNED TO THE SAME HIGH STANDARDS AND ATTENTION TO DETAIL AND USING THE TECHNOLOGY OF THE 1980'S

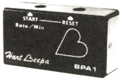
HART BEEPA

This novel heart monitor lets you listen to your heart and provides easy measurement of heart rate. Build it for biofeedback, exercise rate testing, or just plain fun.

When held between the palms of the hands (or positioned on the chest) the "Hart Beepa" produces an audible note which pulsates in step with the beating of the heart.

By touching the START switch the pitch of the pulsating note becomes higher for a precise time period. The heart rate per minute is obtained by counting the beats which occur during this higher pitch time.

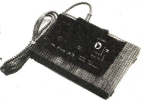
KIT $49.50
FULLY BUILT $69.50
P & P $5.00



HI PHONE

This popular kit converts any telephone to hands free loudspeaking operation. Now in improved full duplex version.

FULL KIT INCLUDING LIGHTWEIGHT HEADPHONES. $89.00
FULLY BUILT $129.00 P & P $5.00



AM3 AM RADIO KIT

Highest quality design, construction and sound designed to drive modern lightweight headphones.

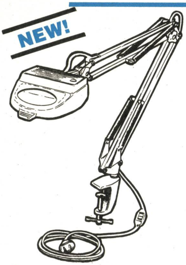
Short form kit: all parts except the vernier dial and case. Price $14.50.
Full kit: all parts including the vernier dial and case. Price $24.50.
LIGHTWEIGHT HEADPHONES $7.50
P & P $3.00

TECHNICRAFT
ELECTRONICS

338 KATOOMBA ST.
KATOOMBA
N.S.W. 2780
AUSTRALIA
TEL. (047) 82 3418

★★★★1986 NEW PRODUCT LINEUP

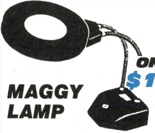
NEW!



Low cost desk lamp/magnifier.

Following the footsteps of the very popular "Maggylamp", we now have a low cost version which clamps to benches, desks etc. The lens is around 100mm diameter with a focal length of 250mm and 4 dioptres. Sturdy clamp fitting with spring balanced arms. Enamel finish.

Cat. SL2705 **Only $99**



ONLY $169

MAGGY LAMP

Cat. SL-2700

DESK MOUNTED LAMP MAGNIFIER

This unit magnifies any object under a clear cool fluorescent light. The magnification is the maximum obtainable (lens 127mm diameter biconvex 4 Dioptres, focal length 254mm) consistent with minimum distortion and eyestrain and good off-angle viewing.

It is NOT cheap, but then again it will definitely last a lifetime. It is built like a Rolls Royce. (We doubt whether 20 years continuous use would wear out the German made flexible arms for example). Spare fluoro tubes are available either from us or electrical outlets. If you have trouble with fine PCB work or component identification but still want both hands free, this is for you. We thoroughly recommend this quality Australian made product.

Technical Information

Illumination: **22W Fluorescent**
Weight: **8.16kg**
Lateral Extension: **254mm**
Vertical Extension: **254mm**
Fixing: **Heavy table base with two chrome plated flexible arms.**
Lens: **(see text)**

Standard Mic Inserts

Replacement electrets for tape recorders etc. Includes data sheet and application notes. Operates from a single 1.5V battery. 10mm diameter. 50Hz-15kHz. Cat. AM-4010

ONLY $1.95 ea

ONLY $12.95

SCOOP PURCHASE!

GENUINE

SIEMENS

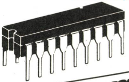
Universal voltage tester with LED indicator

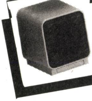
The Siemens "UNISPANN" voltage probe has been around for some time now. You can determine the presence of AC or DC voltages safely anywhere with this quality probe. It will even tell you which AC mains conductor is active and works from 6-500V AC or DC. It also shows DC polarity.

Normally these units are very expensive but a Jaycar SCOOP PURCHASE brings them to you at a great price!

WHILE STOCKS LAST - AN INCREDIBLE BARGAIN
Cat. QT-2220

CQAM CHIP ONLY
MC13020 Cat. ZK-8862
Usually $11.95
NOW ONLY $6.95
SAVE $5.00





LOW COST ULTRASONIC PEST REPELLER

We have secured a quality ultrasonic pest repeller at a very attractive price. This unit has been university tested and works well. It is supplied complete with an approved AC adaptor. It draws 1½ watts of power so electricity costs are negligible.
Cat. YS-5510

ONLY $59.95

DIGITAL FEVER THERMOMETER

Forget those old mercury thermometers. This is the latest in thermometers. Fully electronic, to reset just switch on and off. Temperature is displayed digitally. A must for families with children. Japanese quality. Cat. QM-6130

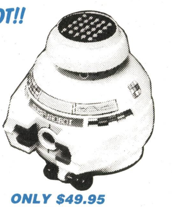
WAS $19.95
SAVE $7.00
NOW $12.95

MIGHTY ROBOT!!

PROGRAMMABLE MOBILE ROBOT

Low-cost fun learning with this sophisticated robot! Have hours of educational fun programming this device to do what you command through the 25-key keyboard on its head.

FEATURES:
★ 4 bit microprocessor controlled ★ 3 speed gears selected by programming through the micro ★ Can travel in 4 directions plus angles and curves ★ Has lights and audio ★ Complex routines can easily be programmed (up to 48 commands long)
Cat. XR-1024



ONLY $49.95
DON'T PAY $59.95

SCOOP!

'SHARP' VHF/UHF Tuners Back!

We had these last year and they were very popular. Now we have another scoop buy but at a special price! If you have the technical skills, you can convert that old VHF-only TV to receive UHF Channel 28 again! (A schematic is provided but we cannot guarantee that the unit will work with your TV.) It is an ideal experimenters unit as it covers both the entire Aust. VHF Band as well as the Aust. UHF Band. Tuner includes attractive front panel, knobs etc.

Cat. DM9004 **$19.95**

DESOLDERING TOOL

As reviewed by Electronics Australia. This unit has many excellent features. Clear body to see when it's full, incredibly strong suction power. Made from high density polycarbonate plastic, one hand easy to use operation and an automatic tip cleaner action. There's even a hole in it to hang on a hook. Supplied with Teflon tip.

Cat. TH-1820 **$12.95**

Replacement Teflon tip ________ **$2.50**
Cat. TH-1822 ________

Cat. MB-3502
SOLAR BATTERY CHARGER
WAS $16.95 SAVE 26%
NOW $12.50

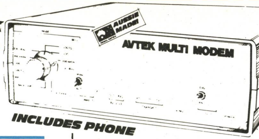
BATTS EXTRA

QUARTZ CRYSTAL CLOCK MOVEMENT

● Very compact and reliable ● Self starting one-second stepping motor has strong torque ● Powered by 1.5V AA battery that lasts for one year ● Supplied with one set of hands ● ±15 second/month accuracy ● 56mm square, 15mm deep. Complete with data sheet & instructions.
Cat. XC-0100

SAVE $2.00 on 1984 Price
ONLY $12.95

— UNBEATABLE★



INCLUDES PHONE

IC INSERTORS & EXTRACTORS

LOW COST Up until now these have cost a fortune!

FEATURES
- ★ CMOS SAFE conductive plastic
- ★ Exclusive bent pin alignment guides in handle. 8 to 40 pins.
- ★ Ground strap can be connected
- ★ One hand operation

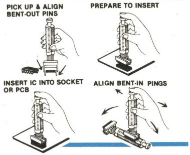
INSERTERS

Cat. TH-1808	CIT 1416 - 8 to 16 pins	**$5.95**
Cat. TH-1810	CIT 1820 - 18 to 20 pins	**$5.95**
Cat. TH-1812	CIT 22-22 /- 22 pins	**$6.50**
Cat. TH-1814	CIT 24-28 /- 24 to 28 pins	**$6.95**
Cat. TH-1816	CIT 3640 - 36 to 40 pins	**$8.95**

EXTRACTOR

Deceptively simple looking device. One piece metal construction. 8 - 40 pins.

Cat. TH-1818	Model ET 480	**$3.50**



AVTEK MULTIMODEMS

State-of-the-art multimodem - has the following data standards CCITT V.21 & V.23, BELL 103 & 202 - Data rates 300, 600 & 1200 BPS - Backward channel 75 BPS in conjunction with 1200 BPS - Computer interface CCITT V.24 (RS232C) - Power requirements 240V AC 3 watts. Talk to the world with this fine Multimodem.
Cat. XC-4820

Note the Mini Modem is now in stock at last!

Latest Multimodem II Cat. XC 4820 **$365**

Multimodem II Autoanswer Cat. XC4822 **$399**

Mini Modem II Cat. XC4825 **$199**

Send SAE for new technical brochure or call in and ask!

Cat. MS-4010
SQUEEKY CLEAN MAINS FILTER x4
$125.00

Cat. MS-4102
SQUEEKY CLEAN MAINS FILTER x1
$39.50

MAIL ORDER HOTLINE (02) 747 1888

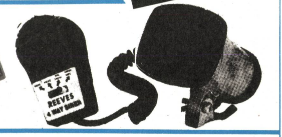
Our Gore Hill Store is open till 4 pm Saturdays

KIDS BIKE "EMERGENCY" SIREN

CB-type mirophone with siren/speaker/horn 4-way switch on the microphone gives you: Police, Fire and Ambulance sirens (all distinctive) PLUS Public Address! (It doesn't make enough noise to be a nuisance but is great fun!)
Cat. AS-3190

ONLY $8.95

Cat. QM-1530
10A DIGITAL MULTIMETER
$89.95

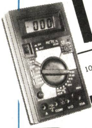


BARGAIN BAGS BACK!

We now have back in stock our famous Bargain Bags. Each bag has over a kilo of useful electronic bits bits 'n' pieces. They never last long so hurry!

Cat. YT-6505
ELECTRONIC CALL DIVERTER
Note: 2 exchange lines are required for this appliance
$159.00

MULTILAYER CHIP CERMICS PACK 100
Cat. RC-5496 - 0.1uF
WAS $25.00 SAVE 60%
NOW $10.00
Cat. RC-5495 - 0.01uF
WAS $25.00 SAVE 68%
NOW $8.00



Cat. QM-1540
10A DIGITAL MULTIMETER/CAPACITANCE METER
$129.00

Cat. YS-5600
SOUND (HANDCLAP) TRIGGERED APPLIANCE SWITCH
WERE $14.95 SAVE 15%
NOW $12.70

☆ EXCLUSIVE!! ☆

GREAT NEW BOARD GAME "TUOHK"

Jaycar is the exclusive NSW distributor of the great new board game called "University of Hard Knocks"
Basically the game works like this:
You load a cassette into your VIC-64 which contains:
5000 'Trivia' type questions
"Community chest" or "Chance"
Type statements
Other instructions
You then lay out the attractive vinyl covered playing board and play the game. The computer provides all questions and answers as well as the odd setback if you land on the wrong square. The game can also be played at different levels so accommodating people playing at the same time with different degrees of general (trivial?) knowledge.
The game progresses until you achieve a "Degree" in the trivia subjects that you have mastered.
No computer skill is required. The computer simply provides information to operate the board game. Around the same price as conventional board games.
Cat. XG-6000

ONLY $49.95
All game pieces etc included.

A great treat for Jaycar customers who own a Commodore VIC-64

14 DAY TRIAL OFFER

Jaycar ELECTRONICS

Incorporating ELECTRONIC AGENCIES
Carlingford, Hurstville, Gore Hill, Brisbane - Mon-Fri 9am - 5.30pm
Sydney and Concord - Mon-Fri 8.30am - 5.30pm
Sydney, Carlingford, Hurstville - Thursday nights until 8.30pm
Brisbane - Thursday night until 8pm
Sydney, Carlingford, Hurstville, Brisbane - Saturdays 9am - 12 noon
Gore Hill - Saturday 9am - 4pm
CONCORD NOT OPEN ON SATURDAYS

NUMBER 1 FOR KITS

N.S.W. SHOWROOMS
SYDNEY: 117 York Street. Tel: (02) 267 1614
CARLINGFORD: Cnr. Carlingford & Pennant Hills Road. Tel: (02) 872 4444
CONCORD: 115/117 Parramatta Road. Tel: (02) 745 3077
HURSTVILLE: 121 Forest Road. Tel: (02) 570 7000
GORE HILL: 188/192 Pacific Highway (Cnr Bellevue Avenue) Tel: (02) 439 4799

QUEENSLAND **BURANDA:** 144 Logan Road. Tel: (07) 393 0777

MAIL ORDERS: P.O. Box 185, CONCORD 2137

HEAD OFFICE: 115-117 Parramatta Road, CONCORD 2137
Tel: (02) 747 2022 Telex: 72293

POST & PACKING

$5 - $9.99	$2.00
$10 - $24.99	$3.75
$25 - $49.99	$4.50
$50 - $99.99	$6.50
$100 - $198	$8.00
Over $199	$10.00

COMET ROAD FREIGHT ANYWHERE IN AUSTRALIA ONLY $13.50

bankcard MasterCard AMERICAN EXPRESS Cards Welcome VISA

MAIL ORDER VIA YOUR PHONE

The Serviceman

Nothing to CRO about in this story

It is bad enough when what starts out as one fault turns into three. It's a lot worse when the third one is one of those "there's-nothing-wrong-but-it-won't-work" types. And it's positively horrific when your most important test instrument simply refuses to cooperate. Many more like this one and I'll head for the bush.

This story is, in one sense, a follow-on from one I told in the November 1985 notes. This concerned the resurrection of a Rank Arena C1851 colour set which had been previously written off, but which I felt was worth restoring on behalf of a local charity — a church community cottage whose previous TV set had finally packed it in.

The set performed well for about six months after I put it into service. Then the staff member in charge of the cottage was on the phone explaining, somewhat apologetically, that the set was giving trouble. As far as I could gather it had been "acting up" for a couple of days, then had finally gone dead.

I wasn't quite sure what he meant by "acting up", and his attempt to describe the symptoms didn't help much, so I simply arranged to pick up the set as soon as I could, and deal with it on the bench.

One objection I have to this set is that, while it uses a 45cm tube, it uses the same size chassis — and many of the same boards — as the original 2601 (63cm) models. As a result, the chassis is a shoe-horn fit in the cabinet and not the easiest thing to extract. But that is more or less by the way.

Once out on the bench, I switched it on and watched for any signs of distress. One showed up immediately; the power supply shut down, clearly indicating that there was some kind of a breakdown pulling the HT rail down and overloading the supply.

A fair bet for symptoms of this kind, in this set, is a shorted line output transistor, TR503. This had already been replaced once in the set's lifetime, the original 2SC1325A being replaced with a 2SD350, a slightly higher rated device. Sure enough, this proved to be the culprit, having broken down completely.

Replacing it didn't present any problem, but I couldn't help asking myself, "did it jump or was it pushed?" or, in other words, was it a spontaneous failure, or had something else failed and taken it out in the process? Well, there was only one way to find out; fit a new one, switch on, and watch for fireworks.

In fact there were no immediate signs of distress. The HT rail came up to normal voltage, sound burst forth from the speaker, and the set showed all the signs of coming back to life. That is, until the picture tube warmed up and a picture appeared on the screen. The first thing I noticed was that there appeared to be no sync in either direction, followed by the realisation that it was underscanning badly in the horizontal mode. I promptly switched it off.

As it turned out, it was just as well I did, otherwise I would have been fitting yet another line output transistor. The set had been on for less than half a minute but the transistor was already up to "sizzle spit" temperature and obviously would not have lasted much longer. So now I had to find fault number two.

How's the tripler?

One possiblity was the tripler. Readers may recall that I had to replace the tripler in the original set and that I used a Philips tripler modified to suit the Rank chassis, employing an arrangement described in the November 1984 notes. What I didn't mention at the time was that the Philips tripler was one salvaged from an old Philips chassis long since junked and ratted for other bits and pieces.

Whether this attempt at economy had now backfired I had no way of knowing, but I couldn't ignore the possibility. Granted, there had been a picture on the screen, meaning that there must have been some EHT present, but stranger things have happened. In any case, it was a simple matter to disconnect the tripler and prove the point.

And this test left no doubt. All signs of distress in the line output transistor vanished, proving conclusively that the tripler was at fault.

Yes it was a strange kind of fault. Usually when a tripler fails — and particularly the Philips tripler — it doesn't muck about; it simply breaks down completely. But this was only a partial failure; probably one diode or capacitor gone leaky and causing enough extra loading to distress the output transistor, yet not enough to prevent it generating some EHT.

Anyway, the remedy was obvious; a new tripler had to be fitted. This time I didn't take any chances; I used a new Philips tripler, modified as before.

Eventually, I was ready to switch on again. This time things looked much more promising; the EHT was normal, the line output transistor was running at a reasonable temperature, and we had full scan width. There was only one snag; we had no sync, either vertical or horizontal. It was possible to juggle the horizontal and vertical controls and produce a temporary picture, but there was no way that either function was going to lock. Fault number three.

Well that was a bit of a set-back. I had started out expecting one fault and was now up to the third. How many more would there be? But I wasn't really all that worried. After all, sync problems are not usually all that hard to track down and, in this case, the failure of both modes seemed like a useful clue; I imagined I would find total loss of sync pulses somewhere in the IF or video stages, due to "crushing" by a faulty stage.

The Rank chassis

For those not familiar with this model, it is very similar to the 2201 and 2601 models and, as I mentioned earlier, even uses some of the same boards. Signal from the tuner is fed to the video IF board, PWC-312, and specifically to pin 1 of IC201. This IC provides part of the IF chain and also involves the AGC and AFT systems.

A second IC, 202, provides more of the IF chain, the video detector, noise cancelling circuitry, and the take-off for the sound IF.

From here the signal goes to the deflection board, PWC-367 (not to be confused with the deflection-out board, PWC-396). PWC-367 carries the sync separator, sync amplifiers, sync delay amplifers, the vertical oscillator and following amplifiers, the horizontal oscillator, and sundry minor functions.

It was somewhere in this signal chain, and particularly in the IF board, PWC-312, that I expected to find the sync pulses going down the drain. There are two convenient test points in this part of the set; TP208 associated with the video buffer stage on the IF board, and TP31 at the input to the deflection board. In fact, electrically, they have only a 680Ω resistor between them.

I stoked up the CRO, set it to observe the horizontal waveform, and connected it to TP31. Now this should have provided a straightforward observation — either we had sync pulses or we didn't. But it was impossible to tell because there was no way that I could make the CRO lock on the signal. Instead it flashed back and forth across the screen quite randomly. I found it would respond to the horizontal hold control on the set but it was all much too critical to be of any practical value.

So why wouldn't the CRO lock? Frankly, I didn't have a clue. It is a high grade, dual trace instrument which will normally lock on the mere smell of a signal. Was this all part of the fault in the set, or was the CRO on the blink? A quick routine check on known wave forms from another source seemed to clear the CRO of any suspicion, so it was back to the set.

More or less in desperation I moved back to TP208 but found, more or less as I expected, that the situation was exactly the same here. The next logical test point was at TP205, close to the video out terminal, pin 5, of IC202. But, again, there was no way that the CRO was going to lock.

At this point I was completely confused; at a total loss to explain what seemed to be a completely contradictory situation. In desperation I decided that the time had come to abandon the scientific and resort to the primitive — or, more specifically, replace the suspect board with one of a couple of spares I had on hand. While it might not pinpoint the exact trouble it should at least get the set working and perhaps provide some hint as to the nature of the fault.

So out came the video IF board and in went a spare. Then I switched on and tried again. Result; exactly the same as before. This was such a shock that I even went so far as to fit the other spare board. This also behaved exactly as before. About the only thing I had learned from this part of the exercise was that the video IF board was not to blame.

But if it wasn't this board what was it? Something funny in the tuner? (I couldn't imagine what). Well, at least that wasn't hard to check. I had a spare tuner on hand and it was a simple matter to patch it in. Again I drew a blank; no difference whatsoever.

So if it wasn't in the tuner or the video IF board it must be further down the line somewhere, say in the deflection board. I had a spare one of these also, and made ready to change it over. But first I made another observation. By juggling the vertical and horizontal hold controls it was possible to float the picture, momentarily, into its correct position on the screen. And when I did the picture was normal in every way — a good sharp picture with, most importantly, perfect colour.

All of which seemed to suggest that there was little else wrong with the video signal. But that only further confused the issue. So I went ahead and changed the deflection board. This also proved negative.

The last straw

That was the last straw. My mind was going round in circles and getting nowhere. I decided to put the set aside and get on with something useful. Maybe I would think of something when I least expected to. (Or look through the real estate ads for a cheap chicken farm!)

And so I busied myself with more important jobs over the next few days and deliberately didn't go near the set. But I thought about it a lot and, on more than one occasion, reached for the circuit to check out an idea. Most of them came to nothing, but I did eventually come up with one which seemed worth persuing.

This was along the lines that some kind of spurious signal, perhaps from the line output stage, was finding its way back into the IF or deflection boards and, somehow or other, gumming up the sync pulses or sync mechanism. The most likely culprit seemed to be the 19V rail which feeds both these boards. If one of several decoupling networks in this line had failed then it might be feeding line energy into one or both boards.

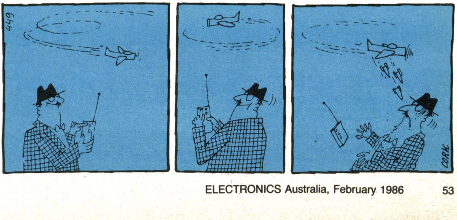
Unfortunately, the CRO quickly disproved this theory, but I still had one other likely path. This is one from the line output transformer (pin 9) via plugs A2 to pin 5 of IC201 on the IF board. This carries a gating pulse of some 35V negative peak, but I was theorising that something may have run amok and created a much larger peak.

Again, the CRO knocked that idea on the head, the waveform being exactly according to the manual.

(Incidentally, the only source of waveforms I have — and the only ones ever published as far as I know — are those in the 2201 manual. This presented a problem later).

And so both ideas had drawn a blank. For the moment I was back to square one with a fault which, seemingly, was even bamboozling the CRO. If only I could get a good look at the waveform and find out what was happening to the sync pulses.

It was at this point that the old grey matter finally began to earn its keep. Some years ago I made up a rather novel piece of test gear consisting of a portable monochrome receiver, with a 15cm screen, which I used for testing



antenna performance in difficult locations. It is simply an El Cheapo unit to which I have fitted BNC connectors to enable video signals to be fed into, or taken out of, the video section as required.

I set this up with its video output feeding one beam of the CRO and with its tuner fed from the colour bar generator. As expected, this produced a typical staircase pattern, complete with colour burst and sync pulse. I then locked the second beam of the CRO to the first one, so that they were sweeping in sync, fed the Rank tuner from the colour bar generator, and connected the second beam to TP31.

And this was the break-through. The CRO remained locked and the colour bar pattern from TP31 was, at long last, clearly visible. What was more, it was a perfect pattern; staircase, colour burst, and sync pulse, exactly as they should be. So there was nothing wrong with the sync pulses this far.

TP31 is at the input to the sync seperator, TR401, and the next two test points, TP32 and TP33, follow this stage. TP32 shows the vertical pulses and TP33 the horizontal pulses. And once again the CRO indicated that the waveforms at both points were exactly as they should be.

All of which put a completely different complexion on the problem. It wasn't a sync pulse problem at all, but something rather more subtle.

At this point I began to formulate another theory. Since it was now virtually certain that there was nothing wrong on either the video IF or deflection boards, it was most likely on the following board, the deflection-out board. And this was the board associated with the two previous faults; the failed tripler and line output transistor. So could a third component have failed at the same time?

AFC circuit

Taking this reasoning one step further I began thinking in terms of the AFC circuit used to lock the horizontal oscillator. According to the 2201 manual this circuit, on the deflection board, is controlled by a pulse from the line output transformer (on the deflection-out board) and fed to the deflection board via the H4 plugs. This is shown as having a value of 250Vp-p at the transformer but, by the time it reaches its destination at diodes D501 and 502, via a complex network of resistors and capacitors, it is down to 4Vp-p.

The main weakness in this little bit of research was revealed when I began tracing out the pulse line on the C1851 circuit, and realised that this is where the two circuits differ markedly. Whereas the pulse is taken off line output transformer pin 3 in the 2201, it is taken off pin 9 in the C1851. Nor is it a passive circuit as in the 2201; it now goes via an AFC amplifier stage, TR505.

Now it didn't need Sherlock Holmes to put that transistor high on the list of suspects: even poor old Dr Watson could have worked that out. Nevertheless, I went through the motions of checking for the pulse at one of the H4 plugs and found, as I expected, that there was no sign of it. I backtracked to the transistor collector with the same result, but found a good healthy pulse at its base.

So it was out with TR505 and in with a suitable substitute. It was almost an anti-climax after that; the pulse appeared where it should and the picture locked up perfectly in both modes, almost as though there had never been a fault. And the CRO, connected to TP31 as in the original set-up, locked up perfectly with no outside assistance.

Then it was simply a matter of tidying up, giving the set a routine once-over and the minor adjustment of the controls, and returning it to the community cottage. In that sense the job was finished. But not in my mind. I kept asking myself why the CRO had refused to lock properly in the presence of this particular fault.

When I was able to think about it a little more calmly, I finally worked out what I believe is the explanation. The truth is that the CRO did not fail to lock; it simply locked on the wrong signal. More precisely it was locking on signals from the line output stage which, along with the line oscillator and in the absence of the AFC pulse, were running free. So, as the line frequency drifted up and down, the CRO went with it.

Unfortunately, the exact mechanism by which this was happening is not quite so clear. My theory is that, in this model set at least, energy from the line output stage is not as well contained as it might be and finds its way into the front end boards either by radiation, conduction through various interconnecting cables, or combinations of these mechanisms.

In any case, it seems virtually certain that, at the various test points I used, there was sufficient line output energy to override the relatively weak sync pulses in the video signal. From a strictly academic point of view this may be criticised as a design weakness but, in practice, it probably doesn't matter two hoots, because the two pulses are locked together anyway.

But disable the AFC pulse and you have the serviceman walking up the wall and across the ceiling — with his bags packed!

Correspondence

That much out of the way, let's look at some letters I have received recently. The first is from Mr C.J.K. of Williamstown, Victoria, and he writes as follows:

The enclosed capacitor (4700µF 16V electrolytic) was part of a power supply for a computer mini disk drive; an MPI B.52 as supplied for a Dick Smith System 80 computer.

I had a long and annoying problem with this computer system; every time the mains voltage dropped below 232V

PC/XT/AT and Compatibles

"Mainframe Storage on a Micro"
with **UNi-X** Volume Control
10 Mbytes to **240 Mbytes**
in 1 to 24 Volumes
UNi-X computer systems and upgrades

Phone PRODATA (07) 289 1955

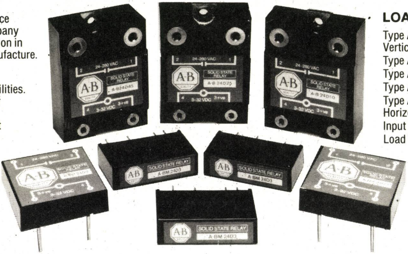
NEW SOLID STATE RELAYS.

The best from Allen-Bradley.

More quality and performance from Allen-Bradley the company with an outstanding reputation in electronics component manufacture.

FEATURES

- High Surge Current Capabilities.
- Zero Voltage Switching for low RFI.
- Opto Isolated Input, Output Terminals – 2.5KV rms.
- Industry Standard Packages for Interchangeability.
- Logic Level Control Signals.
- Meet UL Flammability Requirements.



LOAD CURRENT

Type A-BM: 3 amps PCB Mounting Vertical

Type AB 24D10: 10 amps

Type AB 24D25: 25 amps

Type AB 24D45: 45 amps

Type A-BP: 3 amps PCB Mounting Horizontal.

Input Voltage all models 3-32 V DC.

Load Voltage all models 24-280 V AC.

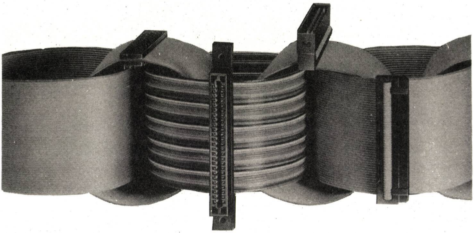
Your Allen-Bradley Component Sales Centre has stocks of these amazing new Solid State Relays available now.

A-B QUALITY ALLEN-BRADLEY

Design excellence and quality in the best tradition.

VIC. 37 Chapman Street, Blackburn, 3130. **Ph. 899 0335**
N.S.W. 22 Parramatta Road, Lidcombe, 2141. **Ph. 648 2652**
QLD. 1925 Logan Road, Upper Mt. Gravatt, 4122. **Ph. 343 7900**
W.A. P.O. Box 23, Subiaco, 6008. **Ph. 387 1702**
S.A. K. D. Fisher, P.O. Box 170, St. Marys 5042. **Ph. 277 3288**

RIBBON CABLE CONNECTORS



Features . . .

- No cable stripping-simultaneous termination of all conductors
- Connectors packaged in kits
- Easy visual inspection of termination during assembly
- AMP matched application tooling assures fast, economical terminations
- Terminates flat ribbon cable with round conductos on 1.27 mm centers
- Positive, uniform latching of contacts and housing with cover eliminates cover warpage

FOR THE FASTEST SERVICE IN THE WEST . . . OR THE EAST

CONTACT

East-West Electronic Distributors Pty Ltd

117 Smith Street, Fitzroy 3065
Telephone: 419 9833

4/16-20 Henley Road
Homebush 2140
Telephone: (02) 763 1588

AUTHORISED DISTRIBUTOR FOR AUSTRALIAN AMP

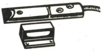
SUPER SAVINGS ON DSE ALARMS..THEY'RE A STEAL!

ALARM HORN SPEAKER NOW $4 OFF!

Use on alarm systems with siren (speaker) output. Weather-proof plastic body ideal for outdoor use. 8 ohm impedance.
Cat C-2705

Was $11.95 NOW $7.95

SECURE YOUR GARAGE & PROTECT YOUR CAR!



Reed switches designed for garage roller and overhead doors. Connected to security system provides full property protection.
Cat L-5220 ~~$29.95~~ NOW $14.95

APPLIANCE ALARM

AT $60 OFF IT'S A STEAL!

Brilliant! Plug in TV, VCR, etc. (up to 4 appliances) to control unit ... if an intruder tries to lift them an alarm sounds. Even add security sensors for an affordable home alarm system.
Cat L-5052

Was $129 $69

BOAT ALARM WE'VE SUNK $70 OFF

Cat L-5098

Face it — you're not on your boat 24 hours a day, 7 days a week. Your boat and valuables are vulnerable. But with this DSE alarm system, you're covered. Package features strobe light, electronic siren and magnetic switches. PLUS multiple protection zones allows you to tailor system for individual requirements.

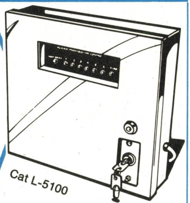
Was $169 NOW $89

VALUE $20 OFF

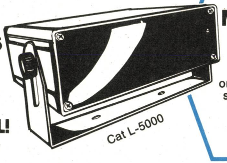
SECURITY CENTRE ...

Pro quality security for home and commercial use — at a fraction of the cost! Centre suits most popular detection devices: reed switches, etc. Controls 6 sectors — any of which can be isolated — with selectable instant or delay alarms. Steel casing and battery backup provision makes it virtually tamper proof.

Was $199 NOW $179



Cat L-5100



Cat L-5000

SAVE $40

MICROWAVE DETECTOR

Take the right step towards effective home security. This affordable unit uses discreet microwaves to detect movement — up to 7.5m! Ideal for room surveillance or covering entry/exit points. Works through some plaster walls and ceilings. Adjustable sensitivity.

Was $119 NOW $79

SAVE $20

PASSIVE INFRARED DETECTOR

Top of the line movement detector — used by banks, etc. for reliable protection! Covers broad areas, detecting movement by changes in body temperature — up to 25m. Dual element sensors minimise false alarms, adjustable to compensate for house pets.
Cat L-5010

Was $119 $99

ACCESSORIES? You name it ... DSE has it! A complete range of security peripherals to expand and compliment any security system.

DICK SMITH ELECTRONICS
PTY LTD

SEE ADDRESS DETAILS PAGE 98

B.111/CW

the computer would throw a "wobbly" and not cooperate with me.

So one cold night, when everyone had their heaters on, I couldn't take it any more and decided to fix it. After probing around with the CRO I found two faults. The first was in the computer power supply — one of the diodes in the bridge rectifier was open circuit. This was enough to let the 5V regulated supply drop to 4.5V. Replacing the diode solved the problem with the low mains voltage.

However, there was now a problem when loading from the disk drive; it was going into a "wobbly". This is where the capacitor comes into the picture. Although the external appearance indicated that it was correctly oriented, it was in fact in the circuit the wrong way round. This was because the plastic case on the capacitor had been manufactured with the positive indicator pointing to the negative end.

Needless to say a new capacitor cured the problem, but how many other pieces of equipment have one of these capacitors in their circuits with the positive indicator pointing to the negative end? The motto for me: never take it for granted that the indicator on a capacitor is pointing in the right direction.

Thank you C.J.K. for what should be a useful warning for other readers. It is something of a new twist to the old problem of wrongly colour coded resistors, at least under the general heading that you can't trust anything any more.

Finally, I must acknowledge a letter from Mr G.N.D. of North Geelong, Victoria, and apologise for the delay in so doing. This reader wrote after reading my comments in the May 1985 issue, regarding the problem of playing a video tape made in Brazil and which uses a hybrid TV system of 525 lines, 60 fields, and PAL colour encoding.

It is a fairly long letter setting out the world TV standard situation in broad terms and listing several other countries having hybrid standards. For example, Barbados, Bolivia, and Burma use 625 lines, 50 fields, and NTSC colour. It also discusses at some length those systems which are compatible via video tape and those which are not.

Also enclosed was a swag of photocopied pages taken from a couple of magazines. One is called "What Video" and appears to be from the UK and the other is "Videoworld", an Australian publication.

In total, it adds up to a vast amount of information and extremely useful background material, but far too much to reproduce in these notes, even in condensed form. However, it may be possible to reproduce the major portion of G.N.D.'s letter at a latter date, if only to emphasise just how complicated the situation is.

In the meantime, what happened about the tape from Brazil? Well, it's a long story and it took a long time to get results, hence my silence until now. Briefly, it went something like this.

I had found a company willing to "give it a go" but, when they tried to play it, it was found that it had been made to the more recently adopted standard of half speed — though why I can't imagine.

The company had no machine which would play it, but had one on order from the US. So several months went by until this finally arrived, at which point they tried again. This time they had more luck and a playable copy was produced. I use the word "playable" advisedly because, while it moved, talked and had "some colour", it was anything but marvellous.

It was a straight optical copy and, as a result, suffered from very obvious 10Hz flicker, and moire patterning due to the conflict of line standards. But, within a modest price structure, that is about the best that one can expect. For something better you would be looking at several hundred dollars an hour, with a substantial minimum charge.

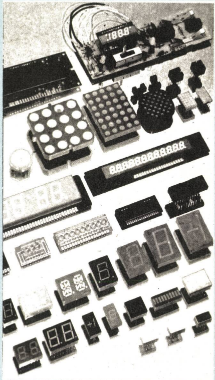
On the other hand, the charity concerned was delighted. They could see and hear their colleagues in another country and a bit of flicker and patterning was of little consequence. And, to cap it all, the company made only a nominal charge — little more than the cost of the tape — because it was for a charitable organisation.

So everyone was happy. EA

TETIA Fault of the Month

National TC2202 (MB chassis)
Symptom. Very blurred. Out of focus image. Moving vertical coloured stripes. Sometimes a white line appears at top of screen.
Cure. No vertical scan. R444 (1Ω 1/2 W) open circuit. D407 (UF2) shorted. This removes 24 volt rail. D403 (SV02) has also been found open circuit.

This information is supplied by courtesy of the Tasmanian branch of The Electronic Technicians' Institute of Australia. Contributions should be sent to J. Lawler, 16 Adina St, Geilston Bay 7015.



LITON
LED
SPECIALIST

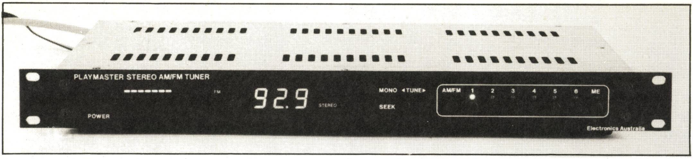
ADILAM
Your reliable direct distributor of Liton

Products include
Lamps and Light Bars
Numeric Displays
Dot matrix displays
Clock modules
Infrared products
Hybrid modules

— Contact us now for a product summary

AE Adilam Electronics Pty Ltd

Melb — Suite 7, 145 Parker St, Templestowe (03) 846 2511
PO Box 52 Bullen, 3105 Tlx 151369
Syd — 30 Colson Cres, Monterey 2217 (02) 587 1554
Adel — K. D. Fisher (08) 227 3288
Bris — F. Hoe & Sons (07) 277 4311
Canb — Electronic Components (062) 80 4654
Perth — Atkins Carlyle (09) 321 0101
Prospec (09) 362 5011



Third article has the construction details

Playmaster AM/FM stereo tuner

Pt. 3

Although the circuit of our new Playmaster AM/FM Stereo Tuner is fairly complex, construction is quite straightforward. This month, we detail the PCB assemblies, give the coil winding details, and present a complete wiring diagram.

by JOHN CLARKE

Because the tuner circuit includes a number of specialised components, we recommend that it be built from a complete kit. This constructional article will assume that pre-punched metalwork has been supplied, along with a screen-printed front panel and all other necessary parts.

A main single-sided printed circuit board (PCB) coded 85tu12 and measuring 330 x 220mm accommodates most of the tuner circuitry. This includes the AM tuner, FM IF strip, filters, and microprocessor control components.

A smaller double-sided PCB coded 85fm12 and measuring 94 x 49mm is used for the FM front end. This board is shielded with a tinplate box and secured to the main PCB with screws and nuts. Electrical connections between the two boards are via an 8-way pin header.

A second double-sided PCB accommodates the display and switch components. Coded 85db12 and measuring 370 x 35mm, it is secured to the front panel of the tuner case. Rainbow cables connect between this PCB and the main PCB via 8-way pin headers and matching cable connector sockets.

Finally, a single-sided PCB coded 85ps12 and measuring 65 x 100mm is used for the power supply circuitry.

The complete tuner circuit is housed in a slim-line rack mounting cabinet measuring 430 x 254 x 44mm.

Commence construction by inspecting the PCBs for shorts between tracks or breaks in the copper pattern. Check also that all the holes have been drilled and that a square cutout has been made in the main board for IC1.

If the square cutout has not been made, proceed as follows: Position IC1 on the underside of the PCB and line up the IC pins with the copper tracks. Now mark the outline of the IC body at each corner with a pencil and drill a large hole in the centre of the marked area.

The cutout can then be carefully filed to the correct size. Once completed, the IC should sit neatly in the hole with all pins lined up with the copper tracks.

Do not solder IC1 in position at this stage.

Begin assembly of the PCBs by installing PC stakes at all external wiring points. These points are clearly indicated on the wiring diagrams. PC stakes are also used on the main board to terminate the connections from the loop antenna sockets and to terminate the leads to T1.

Note that PC stakes 1 to 8 on both the main and power supply PCBs are inserted upside down (ie, with the shorter section on the component side). This is to allow the power supply wiring to be run to the underside of each PCB.

The PC stake on the display PCB (at point 11) is also inserted this way. All other stakes are inserted conventionally, with the longer section on the component side of the board.

Main PCB

Continue assembly on the main PCB by installing all the low profile components. These include the wire links, resistors, diodes, ICs and transistors. Note that some of the resistors are 2% tolerance types. These are marked with a star on the parts layout diagram.

Check the orientation of the diodes, transistors and ICs when they are being installed. Be sure to use the correct semiconductor type at each location.

A special technique is used for soldering IC1 into position. This is a surface-mounting component containing 52 closely-spaced leads. As a result, normal soldering methods will cause solder bridges between the tracks.

First, use your soldering iron to tin each of the copper track lands where the pins of the IC will make contact. Use a soldering iron temperature that is just sufficient to melt the solder and quickly tin the copper with a thin layer of solder.
along each of the pre-tinned leads of IC1 to clean them. The IC can then be installed from the copper side of the board with the pin 1 indication (a dot in one corner) positioned as shown in the parts layout diagram.

To solder the IC, first clean the tip of your soldering iron with a damp sponge to remove any excess solder. Now heat each corner pin of the IC along its whole length so that it melts the solder on the copper track below. At the same time, use a small screwdriver to hold the heated pin hard against the PCB until the solder cools.

The remaining leads of IC1 are then soldered in similar fashion.

The main PCB assembly can now be completed according to the wiring diagram. This involves installing the capacitors, ceramic filters, trimpots, 8-way pin headers, regulator ICs and the crystal.

Note that the display +5V regulator lies flat against the PCB and is fitted with a small U-shaped heatsink. Apply a smear of heatsink compound to the back of the regulator tab before bolting it down.

Six different capacitor types are used on the main PCB: electrolytic, tantalum, supercap, metallised polyester and two types of ceramic. The electrolytics and tantalums are the only polarised types. The supercap is non-polarised and can be inserted either way round.

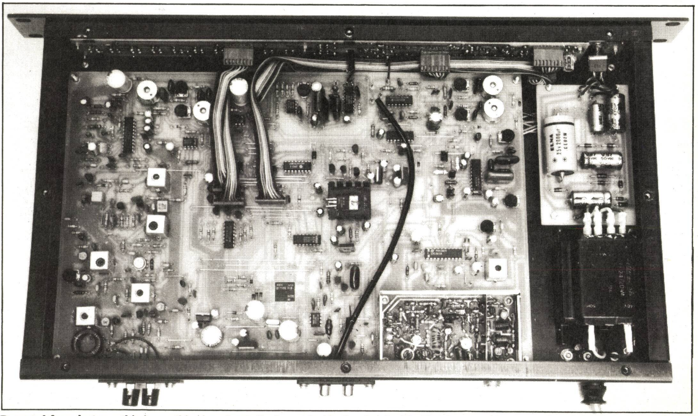
The Philips miniature ceramic plate capacitors are flat-bodied types with yellow bodies and coloured tops. Do not substitute for these capacitors otherwise the tuner will be microphonic. They are marked on the parts layout diagram with a small cross.

The three trimmer capacitors in the AM tuner section should all be oriented so that the flat side of the trimmer body is inserted into the ground track.

Ceramic filters

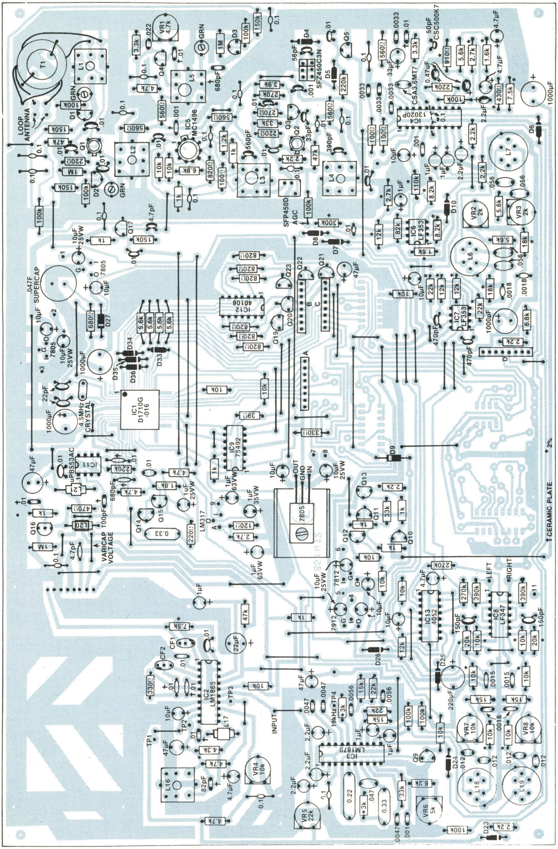
Five ceramic filters are used in the circuit, two in the FM tuner and three in the AM tuner. The SFE10.7ML ceramic filters in the FM section (CF1 and CF2) have a dot on the body to indicate the output pin.

The SFP450D can only be installed one way, while the SFZ450C3N narrow



Repeated from last month's issue, this view shows the layout inside the chassis. The FM front end is at bottom right.

Playmaster stereo tuner



Here is the parts layout for the main PC board.

band ceramic filter should be installed so that the arm of the cross embossed on top of the filter body is adjacent to the right hand side of PCB. The CSA3.6MT7 resonator can be installed either way round.

Coil winding

Fig.1, Fig.2 and Table 1 show the coil winding details. To avoid confusion, we recommend that each coil be soldered into circuit as it is completed.

The 16-turn centre-tapped primary of T1 is bifilar wound (see Fig.2). To do this, cut two 550mm lengths of 30B&S enamelled copper wire (ECW) and twist the two wires together using a hand drill until there is about one twist every 3mm.

Wind 16 turns on the toroid and determine the ends of each winding using a multimeter. The 50-turn secondary can now be wound on the opposite side of the toroid using 36B&S ECW.

Fig.2 shows how the primary and secondary windings are connected to the PC stakes on the main PCB. The toroid is secured to the PCB using two wire straps as shown in the layout diagram.

Table 1

Coil	Type	Wire	Turns	Start	Finish
L1	7210	36B&S	50	pin 4	pin 5
		jumble wound			
L3	E1	36B&S	60	pin 5	pin 4
		36B&S	60	pin 4	pin 6
		bifilar wound			
		36B&S	46	pin 2	pin 3
		jumble wound			
L5	E1	36B&S	6	pin 2	pin 4
		36B&S	70	pin 4	pin 3
		36B&S	7	pin 2	pin 1
		36B&S	9	pin 6	pin 5
		jumble wound			
L6,L7	PL14/8	36B&S	250	pin 3	pin 5
		jumble wound			
L15	E3	30B&S	16	pin 1	pin 6
		30B&S	7	pin 4	pin 3
		jumble wound			
L16	A5	30B&S	16	pin 1	pin 6
		single layer wound			
L18,19	PL14/8	36B&S	250	pin 3	pin 5
		jumble wound			
L21		26B&S	13 turns on F16 slug		
		single layer wound			

L1 is a standard 7210 coil which requires an extra winding between pins 4 and 5. To do this, first remove the metal cover from the coil baseplate. This done, jumble wind 50 turns of 36B&S ECW on the stem above the ferrite shield for the main coil. A few drops of molten candle wax over the coil will hold the windings in place.

Clean the ends of the wire with a sharp knife or fine glass paper and solder them to terminals 4 and 5. Finally, replace the metal shield.

L3 is wound on an E1 coil assembly. Cut two 755mm lengths of 36B&S ECW and twist them together using a hand drill so that there is about one turn every 3mm. Wind on 60 turns and separate each winding by testing for continuity with a multimeter.

It is important that the start of one winding be connected to pin 5 and the start of the other to pin 4. The finish ends of the windings go to pins 4 and 6 respectively.

The 46 turns of 36B&S wire can now be wound on top of the bifilar winding. This done, slip the ferrite cylinder over the winding, install the plastic cover and screw in the ferrite slug. Finally, replace the metal shield.

L5 is also wound on an E1 coil assembly and is critical for correct oscillator operation. Table 1 has the winding details. Be sure to wind all coils in the same direction and seal the windings with wax after they have all been completed.

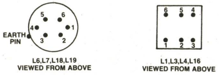

5
6
4
1
EARTH PIN
3
2
L6,L7,L18,L19 VIEWED FROM ABOVE
6
5
4
1
2
3
L1,L3,L4,L16 VIEWED FROM ABOVE

Fig. 1

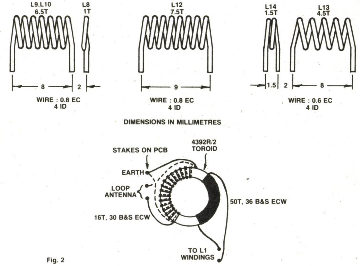


Fig. 2

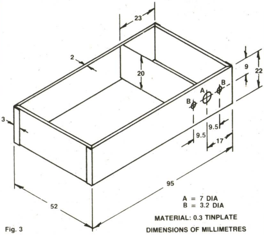
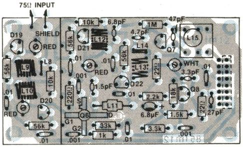


Fig. 3

This diagram shows the dimensions of the metal shield for the FM front end.



Parts layout for the FM front end. The parts are mounted on the track (blue) side of the PCB.

• PHONE YOUR ORDER — ALTRONICS TOLL FREE 008 999 007 •

FOR NEXT DAY JETSERVICE DELIVERY

BANKCARD HOLDERS — PHONE ALTRONICS TOLL FREE 008 999 007

1986 ALTRONICS ELECTRONIC COMPONENTS CATALOGUE

YOURS FREE with this month's Electronics Australia Magazine
OR send $1 to cover P&P to Altronics, P.O. Box 8280, Stirling St., Perth, W.A. 6000

REMEMBER

Altronics staff are all keen young electronics enthusiasts — just like yourself — so when you need a little technical help, give us a call.

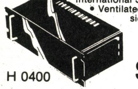
★ Quality Products at direct import prices.
★ Save up to 50% on our competitors prices.
★ Overnight delivery Australia wide.
★ Bankcard phone orders service to 8pm Mon-Fri.
★ Check some of the savings on our nearest competitor

STD FREE PHONE ORDER SERVICE

An Altronics 1st is our **INWATS Toll Free Order Line.** Bankcard holders can call us from anywhere in Australia for the cost of a local call and place your order; after validating your Bankcard, **presto** the order is on its way to you in a matter of hours. Remember with our **Overnight Jetservice** we deliver next day to capital cities and suburbs and 24 - 48 hours later to country centres. So if you're not already an Altronics Customer just pick up the phone and dial 008 999 007 and we guarantee to deliver faster than your local supplier.

ECONOMY RACK CABINET

- Solid Steel Construction
- Black anodised front panel
- 3 unit (132mm)
- Conforms to International Standards
- Ventilated top and side panels



H 0400

ONLY
~~$49.50~~
$45

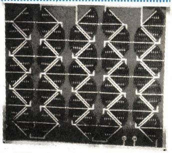
Price Break Through
Solar Cell Array
18V @ 7 Watt

Price Break Through $89.95

Amazing

Brilliant New Solar Array at an amazing price. Yes, for less than $90 we now have just the handiest Solar Modules available (why pay our competitors $239 for a measly 3 additional watts?? Superb for Powering or Charging 12-15 Volt circuits - Now there's no excuse for that flat Car, Boat or Caravan Battery Solar Cells are fixed to a fibre board, front covered with tough EPS and rivetted into stainless steel frame.

A 0220



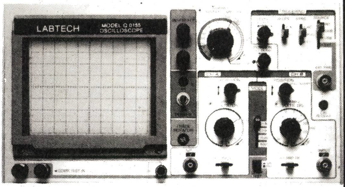
Full 12 Months Warranty

Sensational Labtech

Dual Trace 20MHz CRO With Component Tester Now Under $700!

Definitely Australia's Best Value in Quality Oscilloscope Test Equipment — Just Look at the Facilities

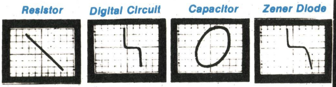
The Inbuilt Component Tester Alone Is Over $300 Value.



DESCRIPTON:
This model is a dual-trace 20MHz Oscilloscope using high brightness CRT. The vertical amplifiers have high sensitivity of 5mV/Div and the frequency characteristic response with the smooth roll off exceeding 20MHz. The highest triggering sweep speed is 0.2 usec/Div. For component test, special circuit is designed, with which a single component or components in or out of actual circuit board can be easily tested, requiring no power to drive the circuit. The display shows fault of components, size of a component value, characteristics of component, and half-dead components under dynamic test.

FEATURES:
• Component Tester • Wide bandwidth & high sensitivity • Very low power consumption • High sensitivity X-Y mode • Z axis (intensity modulation) • Front panel electrical trace Rotator • Regulated power supply circuit for Accuracy

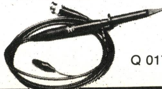
TYPICAL COMPONENT TEST STATUS PATTERNS



ALTRONICS FAMOUS SATISFACTION GUARANTEE
We are delighted with our new Labtech Q 0155 Oscilloscope and Component Tester and naturally we are confident you will be too — However, if for any reason you are less than 100% satisfied with your new Labtech CRO you may of course return it to us (in original condition with all ins*ructions, packaging etc.) within 14 days for a full refund less transport costs.

Q 0155 Value **$699**

Highly Recommended For:
Service Workbench, Design Laboratory, Manufacturers, Universities and the dedicated Enthusiast.



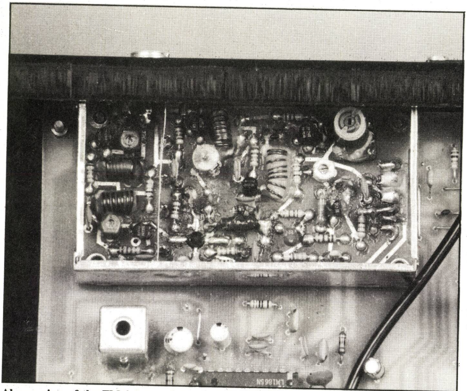
Probe Sets
1:1 or 10:1 Attenuation
Q 0175 **$39.50**

Labtech *Test Equipment for Life*

FOR NEXT DAY JETSERVICE DELIVERY

BANCARD HOLDERS — PHONE ALTRONICS TOLL FREE 008 999 007

• PHONE YOUR ORDER—ALTRONICS TOLL FREE 008 999 007 •



Above: view of the FM front end. The coils are waxed after alignment to prevent microphonics. At right are the parts layout diagrams for the display PCB.

L6, L7, L18 and L19 each require 250 turns of 36B&S ECW wound on PL14/8 formers. These coils are best wound using a hand drill. The coil former can be held between two washers with a bolt and nut to secure the assembly. The bolt is then held in the drill chuck.

A small amount of molten wax can be used to keep the winding in position. Alternatively, insulation tape can be used.

Note that there are two halves to the PL14/8 potcores: the basecore which includes an integral nut, and the top half from which the inductance adjustor enters to screw into the nut. The two halves go together and enclose the coil former.

This assembly is housed within the brass container with the spring located between the top of the container and the top half potcore.

Be sure to solder the leads of the windings to pins 3 and 5 as shown on the baseplate diagram. The baseplate then inserts into the brass container and is aligned so that the rectangular cutout in the side of the container coincides with the slot on the baseplate. Tabs on the container bend over to hold the completed coil assembly together.

L16 and L21 are relatively straightforward and consist of single layer windings on their respective formers (see Table 1). Seal the L16 winding with wax after it has been completed.

FM front end

The first thing to note here is that the parts are installed on the track side of the 85fm12 double-sided PCB. This means that the component leads must be soldered on the component side of the PCB and, in some cases, on the groundplane side as well.

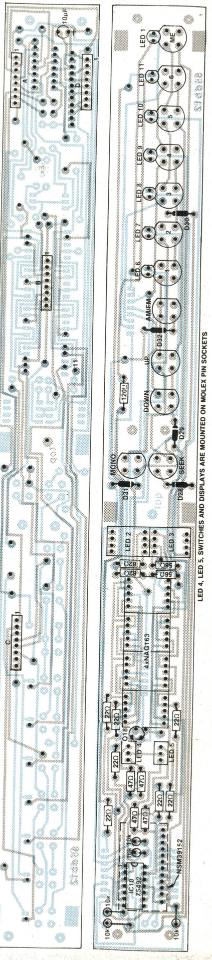
The procedure is quite simple: just remember to solder each component lead wherever it passes through a copper pad.

Begin by installing the six PC stakes (two for the antenna input and four to support part of the metal shield). The resistors, capacitors, transistors and varicap diodes can then be installed, together with inductor L11.

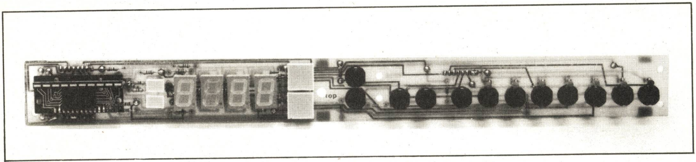
Keep all component leads as short as possible. That is mandatory if it is to perform well.

The 8-way pin header is shown dotted on the parts layout diagram. It is mounted on the underside of the board. Note that several through-board links must be installed adjacent to the pin header.

The trimmer capacitors should be ori-



LED 4, LED 5, SWITCHES AND DISPLAYS ARE MOUNTED ON MOLEX PIN SOCKETS



The assembled display PCB. Note that many of the parts are mounted using Molex pins (see text).

ented so that the pin on the flat side of the trimmer moulding connects to ground.

Coils

Diagrams for the air wound coils are shown in Fig.2. These should all be tightly wound on a 4mm mandrel (eg, a 5/32-inch drill bit) to agree with the dimensions shown on the diagram.

Be sure to wind each coil in the direction indicated in Fig.2 so that it will correctly fit the PCB. Remove the enamel from the ends of the windings before soldering.

L15 is wound according to the data in Table 1 but note that the metal cover is not used with this coil. Note also that the coil must be waxed to prevent microphonic effects. The pins of L15 are soldered to the underside of the PCB only.

Metal shield

A tinplate metal shield surrounds the FM front end and the diagram for this is shown in Fig. 3.

Cut the tinplate to size with tinsnips and bend up the pieces with flat nose pliers. This done, drill holes for the 75-ohm panel socket and attach it to the panel using machine screws and nuts. The side pieces can then be soldered to the ground plane of the PCB and the corners soldered together.

The inner shield piece is soldered at either end to the side pieces and also to the four PC stakes located in-line across the PCB.

Connections between the 75-ohm socket and the PCB are made using short lengths of tinned copper wire.

The FM front end module is secured to the main board using screws and nuts. First, insert the screws from the top of the FM front end PCB and screw on the nuts. The nuts are then soldered to the PCB groundplane and the screws removed.

Finally, mount the module in position, secure it by inserting the four screws from beneath the main PCB, and solder the 8-way pin header.

That completes the FM front end.

Display PCB

The display PCB (85db12) involves several unusual construction methods, so it would be wise to read the following procedure carefully.

There are two overlay diagrams, one showing the components on the top of the PCB and the other showing the components mounted on the underside.

Begin assembly by installing the resistors, diodes, transistor and IC10 on the top of the board. Note that some of the resistors are mounted end-on. As before, component leads must be soldered to both sides of the PCB.

Those pads that do not hold component leads are used for through-board links. There are nine of these through-board links in all.

LED 4, LED 5, the pushbutton switches and the 7-segment displays are all mounted using Molex pins. Take care not to get solder inside the pins when soldering them to the top of the board. You can avoid this by soldering on the flat side of the pin only.

Once the Molex pins have been mounted, the displays and switches can be installed. Orient the switches so that the flat of each switch body faces the right hand side of the PCB.

The 7-segment displays and switches are pushed all the way into the Molex pins, while the LED 4 and LED 5 bar modules are only partially inserted. Line them up with the tops of the 7-segment displays, then solder the bar modules to the Molex pins to secure them.

LEDs 2 and 3 are installed by standing them off the PCB as far as possible.

The NSM39152 bar display module is mounted proud of the PCB using 0.7mm tinned copper wire. You will need 12, 15mm lengths. Solder these into the edge connector bus, then mount the module on the PCB so that it lines up with the 7-segment displays.

The rear side of the display board carries the 8-way pin headers and a 10μF electrolytic capacitor. Solder these in position, then return to the top of the board and install LED 1 and LEDs 6-11 in position (but don't solder them yet).

Next, mount the display PCB on the sub-front panel using 12mm standoffs and countersunk screws and nuts. The front panel can then be bolted to the case using the Allen screws supplied, and the LEDs pushed into the front panel holes. Check that the LEDs are all correctly aligned before soldering their leads.

At this stage, you should check that all switches operate without sticking before removing the display board from the front panel assembly. Any switches that catch in the front panel holes can be adjusted by carefully bending the supporting Molex pins.

Construction of the display PCB can now be completed by soldering the LEDs to the pads on the top side of the board.

Power supply PCB

Assembly of the power supply PCB (85ps12) is straightforward. The main point to watch here is that one of the 470μF capacitors must be rated at 63VW (to allow for variations in mains voltage). The other two 470μF capacitors are rated at 25VW.

Check the orientation of each component before soldering. The diodes are all 1N4002 types.

Chassis assembly

Now that all the PCBs have been completed, wiring can proceed between the power supply PCB and the main PCB. This wiring is run beneath the two PCBs and must be installed before the boards are mounted in the case.

KITS THE AFFORDABLE WAY TO GET INTO COMMUNICATIONS

HF Transceiver

It's fun, challenging and just think of the money you'll save! Being a 'do-it-yourself' job doesn't mean a lack of performance... not by a long shot. Look at these specs! • Covers any 500kHz band from2-30mHz* • switch-able noise blanker • USB, LSB & CW modes • digital frequency display with 100Hz resolution • 30 watts 'pep' output (conservative rating) • RX sensitivity better than 0.3uV for 10dB S+N/N • inbuilt clarifier • 12 volt operation makes it idealfor mobile or portable applications.

$349

Cat K-6330 (80 metre version)

***Some bands require component changes.**

UHF CB 'Yagi' Antenna Kit

Fantastic! Really get into the action with our 13 element Yagi antenna. Boosts signal up to 18 times. Impressive 12.5dBi gain.

***Easy to construct. All you need is a screwdriver and solding iron.**

$39.95

Cat K-6304

For the serious amateur UHF Yagi antenna kit

Talk about performance! It's just the thing for the serious amateur who wants extra range within the 430-440mHz band. Increases signal strength up to 18 times. Impressive 12.5dBi gain.

Cat K-6305

$39.95

Phasing Harness

Wow! The easy, affordable way to 'stack' a pair of antennae to increase signal range. A 'must' for the serious enthusiast.

Cat K-6298 **COMING SOON** **$9.95**

Build your own UHF Transceiver

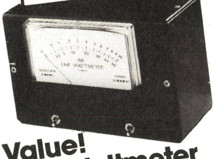
Our Explorer 1 UHF transceiver kit is the most affordable way to get into the exciting world of communications. Enjoy access to 40 channels within the 438.025-439MHz range. With just a little time, you can easily assemble this impressive unit that boasts many features found in more expensive commercial units. Cat K-6300

$189

Repeater Up-Grade Kit

WOW! This inexpensive kit gives the Explorer full repeater capability PLUS S-meter and an extra crystal filter. Includes front panel. Cat K-6302

$14.50



Value! UHF Wattmeter

Just the thing for the UHF enthusiast! The ability to check your transceiver's power output PLUS the efficiency of your antenna system. And what a performer this little beauty is ... it's accurate to within 10%! Directivity is greater than 20dB with insertion loss less than 0.3dB. Covers 400-520MHz range.

As seen in QST & 73 magazines in the USA.

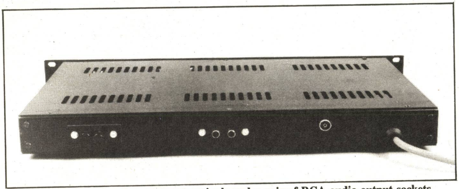
$39.95

Cat K-6312

DICK SMITH ELECTRONICS
PTY LTD

For Address details See P98

B.108/AC



The rear panel carries the antenna terminals and a pair of RCA audio output sockets.

With this job completed, the various items of hardware can be mounted. Begin by fitting the four rubber feet to the corners of the baseplate, then mount the antenna terminals, RCA sockets and power transformer. The wiring diagram shows the general layout inside the chassis.

The main PCB is mounted on 6mm spacers and should be located so that the 75-ohm antenna socket passes through a matching hole in the rear panel. We secured each of the untapped spacers with a nut before installing the PCB. A second set of nuts is then used to secure the board to the stand-offs.

The power supply PCB is mounted on 12mm spacers directly in front of the transformer.

The method of securing the power on/off switch will differ according to the brand of switch. It must be mounted so that the pushbutton knob protrudes the correct disance through the front panel.

In some cases, the switch can be mounted directly on the sub-front panel. In other cases, a mounting bracket may be required to move the switch away from the front sub-panel.

We used a mounting bracket made from fibreglass board material. This was stood-off the sub-front panel using 6mm spacers.

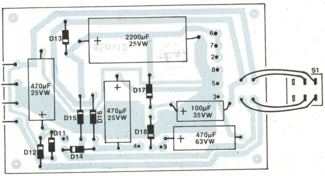
The next step is to mount the display PCB on the sub-front panel using the 12mm standoffs. Note that it may be necessary to use insulating washers between the PCB and standoffs to avoid shorting out the PC tracks. Check this point carefully or you'll strike trouble later on.

The wiring between the display and main PCBs is run using four 8-way cable assemblies. Cut four lengths of 8-way cable — two at 260mm, one at 330mm, and one at 100mm. Separate the ends for 25mm and strip 2mm of insulation from each wire.

The cables can now be connected to the sockets. Insert the cable through the connector socket shell and crimp and solder each wire to the crimp terminals. This done, pull the terminals back into the connector socket.

When the cable assemblies are completed, they can be plugged into the PCB headers. Connect the long cable between the A headers, the two medium length cables between the B and D headers, and the short cable between the C headers.

Check that pin 1 of each header on the main PCB matches up with its corresponding pin 1 on the display PCB.



Parts layout for the power supply PCB. Note the 470µF 63VW electrolytic capacitor.

The display board wiring can now be completed by running a short length of hookup wire from point 11 back to the corresponding point on the main board.

Rear panel wiring

A dual screened cable connects the left and right audio outputs on the main PCB to the output RCA terminals. Note that the cable screen is soldered directly to a PCB stake on the PCB adjacent to the output sockets. From there, a short length of hookup wire also runs to the outer contacts on the RCA sockets (see wiring diagram).

The AM antenna terminals are connected to the main board using short lengths of hookup wire.

Mains wiring

The mains cord passes through the rear panel and is clamped with an in-line cord clamp grommet. The earth wire (green/yellow) is terminated to an earth lug while the active (brown) and neutral (blue) leads are terminated on the transformer pins using bullet connectors. These connectors should be insulated using plastic sleeving.

Scrape away the anodising from around the mounting hole before bolting the earth lug to chassis. This is essential to ensure a good earth contact. Make the earth lead slightly longer than the active and neutral leads so that it will be the last to break if strain is placed on the cord.

The transformer secondary is connected to the power supply PCB using the four leads supplied. Connections to the on/off switch should be run using mains-rated hook-up wire.

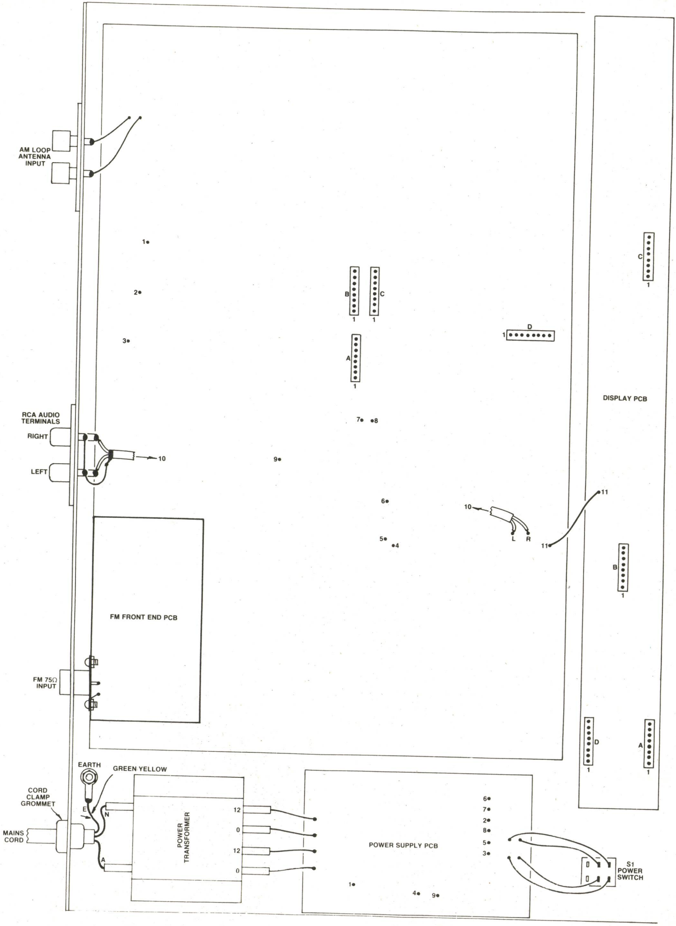
Final assembly

A negative film artwork will be supplied with each kit and this should be affixed to the sub-front panel using double-sided adhesive tape. Position the artwork so that the 7-segment displays and the signal strength meter are all visible.

Finally, the plastic sheet can be fitted to the front panel cutout and the panel bolted to the case. In the prototype, the plastic sheet was held in position by virtue of being a force fit into the panel cutout.

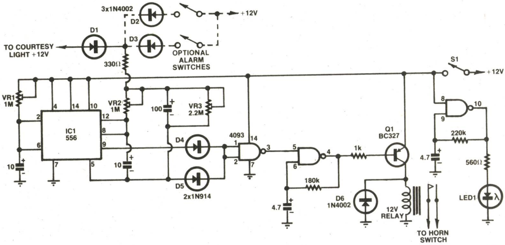
Alternatively, the plastic can be secured by applying a thin film of adhesive to several points along the edges.

That's all we have space for this month. Next month, we will continue with the alignment details. In the meantime, do not be tempted to switch the unit on as there are a few important points to follow.


AM LOOP ANTENNA INPUT
RCA AUDIO TERMINALS
RIGHT
LEFT
FM 75Ω INPUT
FM FRONT END PCB
DISPLAY PCB
EARTH
GREEN YELLOW
CORD CLAMP GROMMET
MAINS CORD
E
N
A
POWER TRANSFORMER
12
0
12
0
POWER SUPPLY PCB
S1 POWER SWITCH
A
B
C
D
1
2
3
4
5
6
7
8
9
10
11
L
R

Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.



Simple car alarm circuit

This simple car alarm circuit features adjustable exit delay, entry delay and alarm time. An oscillator based on IC2c flashes a LED to indicate that the unit is armed and also to deter illegal entry to the vehicle.

Here's how it works. When S1 is closed, the 10µF timing capacitor on pin 6 of IC1 begins charging through VR1 (exit delay). After a short interval, pin 5 goes low and the unit is armed.

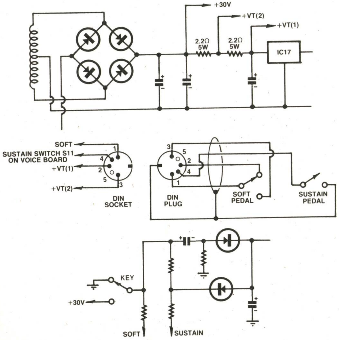
When a door is opened or one of the optional alarm switches tripped, C3 charges rapidly via R1. At the same time, C2 charges via VR2 which sets the entry delay. If S1 is not opened before the entry delay expires, pin 9 of IC1 goes low.

This low is inverted by IC2a which enables oscillator IC2b. IC2b in turn drives Q2 and the relay to pulse the vehicle's horn at half second intervals.

In the event that the door is quickly closed, the alarm will continue to sound until C3 discharges via VR3.

R. Mowe,
Umina, NSW.

$20



Modified soft pedal for Lyrebird piano

The soft pedal circuit of the Lyrebird piano published in *Electronics Australia* during October, November and December 1981 can be improved so that it does not cause notes which have already been played to change abruptly in volume. To simulate the soft pedal action of acoustical pianos, the pedal system needs to be in the keying and envelope circuitry.

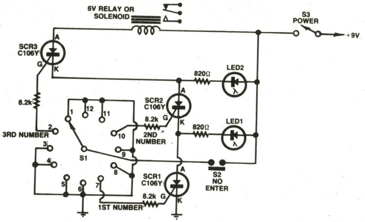
This is easily achieved by splitting the 4.7Ω 5W resistor into two resistors, (for example, 2 x 2.2Ω) thereby creating +Vt1 and +Vt2. By arranging the soft pedal to switch the original +Vt line between Vt1 and Vt2, the desired soft pedal action can be achieved.

The degree of loudness change for the soft pedal can be varied by apportioning the two resistors which substitute for the original 4.7Ω 5W resistor in the power supply.

The two extra leads to the soft pedal can be accommodated by changing the 6.5mm stereo jack and socket to a 5-pin DIN plug and socket. The original soft pedal pin on the voice board is left unconnected.

V. Bien,
Rockdale, NSW

$20



Three-way combination lock

This simple circuit could be used as an electronic lock on a safe or to disarm an alarm system. It uses three silicon controlled rectifiers (SCRs) which have to be triggered in a set sequence.

The numbers are selected using 12-pole rotary switch S1 and entered using momentary contact pushbutton switch S2. When S2 is pressed, either LED 1 or LED 2 will light if the correct number is selected. For example, if position '7' is selected and S2 pressed, SCR1 will turn on and LED 1 will light.

By entering the correct numbers, the SCRs will all be turned on in sequence and the relay activated. In this circuit, the numbers are 7, 10 and 2, but these can easily be changed. If a wrong number is entered, the circuit will automatically cancel the other SCRs.

Note that a numeric keypad could be used instead of the rotary switch. Finally, the security offered by the lock can be increased by increasing the number of SCRs, LEDs and resistors.

J. Kiss,
East Keilor, Vic.

$20

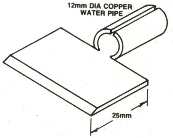
Desoldering tool for ICs

Removing an IC from a PC board can be a difficult task without a solder sucker. That's where this simple tool comes in. It allows you to remove ICs quickly and easily.

All that is required is a heavy-duty soldering iron with a soldering bit of approximately 10mm diameter, and a length of 12mm copper waterpipe.

Cut the pipe so that it is 25mm longer than the soldering iron bit, then cut the pipe lengthwise down one side. This done, cut the pipe nearly through about one inch from one end, open up the 25mm section and flatten.

Once flattened, the end can be shaped with a file to give it a chisel shape. It can then be cut to length to suit the IC to be desoldered.



In use, the device is simply clamped around the soldering iron bit and the chisel-shaped end applied to one row of pins on the IC. A small screwdriver can be used to lift the pins clear of the board.

T. Beekman,
Enfield, NSW.

$15

Wanted: Your circuit and design ideas. We pay between $5 and $40 per item published, depending on the merit and how much work we have to do to publish it. The payment of each of the items on these two pages is given as a guide. If you have an original idea, why not send it in to us? Every item received will be acknowledged by mail.

FLUKE 20 SERIES ANALOG/DIGITAL MULTIMETERS FOR THE TOUGHEST ENVIRONMENTS

FLUKE 21 & 23
- Yellow case colour
- Analog/Digital display
- Touch Hold™ function (23)
- 0°C to 50°C operation
- 0.5% & 0.3% basic accuracy
- 100 uV to 1000V dc
- 1mV to 750Vac
- 10 uA to 10A (23), all fused
- 10 uA to 320 mA (21), fused
- Three-year warranty

FLUKE 25 & 27
- Charcoal or yellow case colour
- Analog/Digital display
- Touch Hold™ function
- −15°C to 55°C operation
- 0.1% basic accuracy
- 100 uV to 1000V ac and dc
- 0.1 uA to 10A, all fused
- Relative (difference) mode (27)
- MIN/MAX recording mode (27)
- Ruggedized, waterproof case
- Two-year warranty

FROM THE WORLD LEADER IN DIGITAL MULTIMETERS.

FLUKE ®

See the Fluke 20 series at leading electronics stores or contact us for data

ELMEASCO
Instruments Pty. Ltd.

NEW SOUTH WALES
15 McDonald Street,
MORTLAKE
P.O. Box 30, CONCORD
NSW 2137
Tel: (02) 736 2888
Telex: AA25887

VICTORIA
12 Maroondah Highway,
RINGWOOD
P.O. Box 623, RINGWOOD
VIC 3134
Tel: (03) 879 2322
Telex: AA30418 ELTENT

QUEENSLAND
Tel: (07) 369 8688
S. AUSTRALIA
Tel: (08) 344 9000
W. AUSTRALIA
Tel: (09) 481 1500

TRANSISTORS

Desc.	10-99	100+	Desc.	10-99	100+
2SJ49	4.50	4.30	2SK134	4.50	4.30
PN2222A	.10	.08	PN2907A	.10	.08
PN3463	.15	.13	PN3565	.12	.11
PN3566	.15	.13	PN3567	.10	.08
PN3569	.18	.16	PN3639	.18	.16
PN3640	.18	.16	PN3641	.10	.08
PN3642	.10	.08	PN3643	.10	.08
PN3644	.15	.13	PN3645	.15	.13
PN4250A	.15	.13	PN4355	.16	.14
PN4356	.16	.14	MPSA42	.23	.20
MPSA43	.23	.20	MPSA55	.15	.14
MPSA56	.15	.14	MPSA92	.22	.20
MPSA93	.22	.20	SC1410	.85	.75
BU126	1.50	1.25	BUX80	2.50	2.20
BU208	2.50	2.20	2SD350	2.75	2.40
BU326	1.95	1.70			

Plus 30% tax where applicable

RCA INSULATING SOCKETS

Cat No.	Desc.	1-99	100+
P10232	2 Way	0.25	0.21
P10234	4 Way	0.45	0.40
P10236	6 Way	0.75	0.60

Plus 30% tax where applicable

RCA CHASSIS MOUNT METAL

Cat No.	1-99	100+
P10231	0.16	0.13

Plus 30% tax where applicable

MINIATURE BUZZER

5-15V White or black.

Cat. A15062	10-99	100+
	0.90	0.80

Plus 20% tax where applicable

ADD ON DISK DRIVE FOR 6502 SYSTEM (APPLE* COMPATIBLE)

1-9	10-24	25+
$150	$140	$130

(*Apple is a registered trademark)

IBM ADD ON HARD DISK

- 10 Mbyte
- Seagate hard disk
- Hard disk controller by Xebec

Cat. X20010 $1295

Plus 20% tax where applicable

MITSUBISHI DISK DRIVES

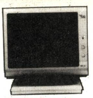
		1-9	10+	25+
4851	5¼"	$160	$150	$140
4853	5¼"	$220	$205	$175
4854	5¼"	$250	$220	$195
2896	8"	$475	$430	$400

Plus 20% tax where applicable

AXIAL ELECTROLYTICS (DOUBLE ENDED)

Cat. No.	Description	10+	100+
R15705	0.47uF 63V	$0.12	$0.10
R15715	1uF 63V	$0.12	$0.10
R15725	2.2uF 63V	$0.12	$0.10
R15742	4.7uF 25V	$0.11	$0.09
R15745	4.7uF 63V	$0.11	$0.09
R15761	10uF 16V	$0.12	$0.10
R15762	10uF 25V	$0.13	$0.12
R15765	10uF 63V	$0.15	$0.14
R15792	22uF 25V	$0.13	$0.12
R15794	22uF 50V	$0.17	$0.15
R15812	25uF 25V	$0.13	$0.12
R15815	25uF 63V	$0.17	$0.15
R15831	47uF 16V	$0.16	$0.13
R15832	47uF 25V	$0.16	$0.13
R15835	47uF 63V	$0.22	$0.19
R15841	100uF 16V	$0.18	$0.16
R15842	100uF 25V	$0.18	$0.16
R15845	100uF 63V	$0.27	$0.24
R15851	220uF 16V	$0.17	$0.15
R15852	220uF 25V	$0.21	$0.18
R15855	220uF 63V	$0.50	$0.46
R15871	470uF 16V	$0.27	$0.24
R15872	470uF 25V	$0.29	$0.27
R15873	470uF 35V	$0.75	$0.70
R15875	470uF 63V	$0.75	$0.70
R15885	1000uF 63V	$0.60	$0.58
R15891	1000uF 16V	$0.39	$0.35
R15892	1000uF 25V	$0.45	$0.40
R15893	1000uF 35V	$0.70	$0.65
R15894	1000uF 50V	$0.00	$0.00
R15903	2200uF 35V	$1.20	$1.10
R15904	2500uF 50V	$1.30	$1.20
R15911	2500uF 16V	$0.59	$0.50
R15912	2500uF 25V	$0.95	$0.90
R15913	2500uF 35V	$1.10	$1.00
R15914	2500uF 50V	$1.30	$1.20
R15932	4700uF 25V	$1.90	$1.80
R15933	4700uF 35V	$2.40	$2.15

Plus 30% tax where applicable



RITRON II

Swivel base monitor in stylish case.

	1-9	10+	50+
Green Cat. X14506	$145	$135	$115
Amber Cat. X14508	$150	$140	$120

Plus 20% tax where applicable

MONITORS

Cat No.		1-3	4+
X14500	Ritron 1 Green	$130	$125
X14502	Ritron 1 Amber	$135	$130

BACK IN STOCK

Plus 20% tax where applicable

CERAMICS 50V PERIOD

	100+	500+
1pF - 2.2nF	$2.20	$2.00
3.3nF - 10nF	$2.50	$2.20
22nF - 47nF	$2.90	$2.70
100nF	$7.00	$6.50
220nF	$9.50	$8.50
330nF	$12.00	$11.00

Plus 10% tax where applicable

ELECTROLYTIC SINGLE ENDED PCB MOUNT

Cat. No.	Descr.	10+	100+
R15405	0.47uF 63V	$0.07	$0.06
R15415	1uF 63V	$0.07	$0.06
R15422	2.2uF 25V	$0.07	$0.06
R15424	2.2uF 50V	$0.06	$0.05
R15425	2.2uF 63V	$0.07	$0.06
R15432	3.3uF 25V	$0.07	$0.06
R15435	3.3uF 63V	$0.07	$0.06
R15442	4.7uF 25V	$0.07	$0.06
R15443	4.7uF 35V	$0.08	$0.07
R15445	4.7uF 63V	$0.07	$0.06
R15461	10uF 16V	$0.07	$0.06
R15462	10uF 25V	$0.07	$0.06
R15463	10uF 35V	$0.07	$0.06
R15465	10uF 63V	$0.07	$0.06
R15481	22uF 16V	$0.07	$0.06
R15482	22uF 25V	$0.30	$0.25
R15483	22uF 35V	$0.08	$0.07
R15484	22uF 50V	$0.09	$0.08
R15502	25uF 25V	$0.07	$0.06
R15505	25uF 63V	$0.10	$0.08
R15512	33uF 25V	$0.08	$0.07
R15521	47uF 16V	$0.09	$0.08
R15522	47uF 25V	$0.09	$0.08
R15525	47uF 63V	$0.10	$0.09
R15531	100uF 16V	$0.10	$0.09
R15532	100uF 25V	$0.08	$0.07
R15533	100uF 35V	$0.15	$0.12
R15535	100uF 63V	$0.24	$0.22
R15541	220uF 16V	$0.09	$0.08
R15542	220uF 25V	$0.14	$0.12
R15543	220uF 35V	$0.25	$0.23
R15545	220uF 63V	$0.26	$0.24
R15552	330uF 25V	$0.15	$0.13
R15555	330uF 63V	$0.34	$0.30
R15561	470uF 16V	$0.16	$0.13
R15562	470uF 25V	$0.23	$0.20
R15563	470uF 35V	$0.30	$0.28
R15564	470uF 50V	$0.00	$0.00
R15565	470uF 63V	$0.44	$0.39
R15581	1000uF 16V	$0.25	$0.22
R15582	1000uF 25V	$0.35	$0.30
R15583	1000uF 35V	$0.45	$0.40
R15591	2200uF 16V	$0.45	$0.40
R15592	2200uF 25V	$0.65	$0.60
R15593	2200uF 35V	$1.20	$0.91
R15601	2500uF 16V	$0.45	$0.40
R15602	2500uF 25V	$0.65	$0.60

Plus 10% tax where applicable

NOW AVAILABLE!
50 Page wholesale price list
Please call in or write to:
P.O. Box 620, CLAYTON 3168
and simply supply a business card!

UNPROTECTED STRIP HEADERS

Dual in Line 2.54mm

		1-9	10+
P12240	10 Way Unprot Header	1.25	1.10
P12246	16 Way Unprot Header	1.35	1.20
P12250	20 Way Unprot Header	1.45	1.25
P12256	26 Way Unprot Header	1.50	1.40
P12260	30 Way Unprot Header	1.75	1.65
P12264	34 Way Unprot Header	1.95	1.75
P12270	40 Way Unprot Header	2.25	1.95
P12275	50 Way Unprot Header	2.75	2.50
P12280	60 Way Unprot Header	2.95	2.75

Plus 20% Sales Tax where applicable

RESISTORS

¼ WATT E12 CARBON BULK
PACKED $5.25/1000
TAPED AND BOXED $5.25/1000
$5.00/1000 10K LOTS
¼ METAL FILM TAPED AND BOXED
$12.00/1000 $11.00/1000/10K LOT
SUPPLY E24 VALUE
Plus 30% tax where applicable

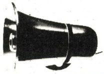
VERBATIM DATA LIFE DISKETTES

		10-99	100+	500+
SS/DD	MD525-01	2.50	2.35	2.25
DS/DD	MD550-01	3.20	2.50	2.40

XIDEX DISKETTES

SS/DD	2.50	2.50	2.25
DS/DD	3.40	3.05	2.85

Plus 20% tax where applicable



HORN SPEAKERS

Cat No.		1-99	100+
C12010	5" Plastic 10W Max	4.80	4.70
C12015	5" Metal 10W Max	4.70	4.60
C12012	12V Siren	8.50	8.00

Plus 20% tax where applicable

MONOLITHIC .1uF 50V

10+	100+	1000+
$0.09	$0.07	$0.06

Plus 20% tax where applicable

GREY FLAT RIBBON CABLE

			PER 100 FT ROLL			
Cat No.	Desc.	Per Mtr	1-3	4-9	10-99	100+
W12614	14 Way	1.29	19.50	18.50	18.00	14.00
W12616	16 Way	1.90	21.50	19.50	19.00	16.00
W12620	20 Way	2.20	29.50	28.00	26.50	20.00
W12625	25 Way	2.50	32.50	29.00	28.50	25.00
W12626	26 Way	2.60	34.00	32.00	29.00	26.00
W12634	34 Way	2.80	44.00	42.00	39.00	34.00
W12636	36 Way	3.00	49.00	47.00	42.50	36.00
W12640	40 Way	3.20	55.00	52.50	49.50	40.00
W12650	50 Way	3.75	62.00	59.50	58.50	50.00

EX STOCK
LARGER QUANTITIES NEGOTIABLE
Plus 20% tax where applicable

CRYSTALS

Cat No.	Frequency	Can	10+	100+	500+	1000+
Y11000	1MHz	HC33	5.50	4.75	4.50	4.00
Y11005	2MHz	HC33	2.25	1.95	1.85	1.70
Y11008	2.4576MHz	HC18	2.25	1.95	1.85	1.70
Y11015	3.57954MHz	HC18	1.20	.90	.65	.60
Y11020	4.00MHz	HC18	1.30	.90	.75	.60
Y11022	4.194304MHz	HC18	1.40	.90	.75	.60
Y11025	4.75MHz	HC18	1.40	.90	.75	.60
Y11026	4.9152MHz	HC18	1.40	.90	.75	.60
Y11042	6.144MHz	HC18	1.40	.90	.75	.60
Y11050	8.00MHz	HC18	1.40	.90	.75	.60
Y11055	8.867238MHz	HC18	1.40	.90	.75	.60
Y11070	12.00MHz	HC18	1.40	.90	.75	.60
Y11072	14.318MHz	HC18	1.40	.90	.75	.60
Y11080	16.00MHz	HC18	1.40	.90	.75	.60
Y11085	18.432MHz	HC18	1.40	.90	.75	.60
Y11090	20.00MHz	HC18	1.40	.90	.75	.60

FULL RANGE OF CRYSTALS AVAILABLE ON INDENT
Plus 20% tax where applicable

POLYESTER 100V "GREENCAP" TYPE

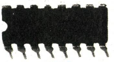
Cat No.		1-99	100+	1000+
R15131	.001uF	0.06	0.04	.036
R15137	.0012uF	0.06	0.04	.036
R15138	.0015uF	0.06	0.04	.036
R15140	.0022uF	0.06	0.04	.036
R15142	.0033uF	0.06	0.04	.036
R15143	.0039uF	0.06	0.04	.036
R15145	.0047uF	0.06	0.04	.036
R15146	.0056uF	0.06	0.04	.036
R15147	.0082uF	0.06	0.04	.036
R15148	.01uF	0.07	0.05	.045
R15150	.015uF	0.07	0.05	.045
R15152	.022uF	0.07	0.05	.045
R15154	.033uF	0.07	0.05	.048
R15155	.039uF	0.07	0.05	.045
R15156	.047uF	0.08	0.06	.055
R15157	.056uF	0.08	0.06	.055
R15158	.068uF	0.08	0.06	.055
R15159	.082uF	0.08	0.07	.055
R15160	.1uF	0.09	0.08	.07
R15162	.15uF	0.11	0.10	.09
R15164	.22uF	0.15	0.14	.13
R15165	.27uF	0.16	0.15	.14
R15172	1uF	0.70	0.55	0.50
R15176	2.2u	1.20	1.10	1.00
R15178	3.3uF	1.50	1.20	

Plus 30% tax where applicable

COMPUTER CONNECTORS

Cat No.	Description	1-99	100+	1000+
P10900	DB25 Plug	1.30	1.20	1.00
P10901	DB25 Socket	1.40	1.30	1.20
P12210	Centronics Solder	3.50	3.15	2.50
P12200	Centronics Crimp	6.00	5.50	5.00
P10880	DB9 Plug	1.30	1.20	0.90
P10881	DB9 Socket	1.40	1.30	1.00
P10890	DB15 Plug	1.30	1.20	0.90
P10891	DB15 Socket	1.40	1.30	1.00
P10902	DB25 Cover	.80	.65	.55

Plus 20% tax where applicable



MEMORY

"Check for the latest memory prices!"

	10-99	100+	1000+	10K+
4164-15P	$2.00	$1.50	$1.30	$1.10
41256	$7.00	$6.00	$5.50	$5.00
6116P-3	$3.00	$2.90	$2.00	$1.80
2716	$4.90	$4.50	$4.25	$4.00
27128	$5.00	$4.50	$4.00	$3.50
2532	$7.50	$6.50	$6.40	$6.30
2732	$6.50	$6.10	$5.90	$5.50
27256	$29.00	$27.00	$22.00	19.00
6264	$5.50	$5.00	$4.50	$4.00

Plus 20% tax where applicable

IC's GALORE!

	1-9	10+	100+	250+
8035	3.90	3.70	3.50	3.00
8085	4.00	3.90	3.50	3.00
8088	19.00	18.00	15.00	14.00
8155	3.90	3.75	3.50	3.00
8156	3.50	3.30	2.90	2.50
8212	1.90	1.70	1.50	1.00
8224	2.40	2.00	1.90	1.50
8226	1.90	1.70	1.50	1.00
8237A	35.00	31.00		
8253	3.90	3.70	3.50	3.00
8255	4.00	3.50	2.90	2.00
8257	3.90	3.50	3.00	2.50
8259	3.90	3.50	3.30	2.70
8237A	35.00	31.00		
8279	3.90	3.50	3.30	2.70

Plus 20% tax where applicable

LOW PROFILE IC SOCKETS

How cheap can they go ??

	10+	100+	1000+	10K
8 Pin	.08	.07	.06	.05
14 Pin	.10	.09	.08	.07
16 Pin	.11	.10	.09	.08
18 Pin	.12	.11	.10	.09
20 Pin	.13	.12	.11	.10
22 Pin	.14	.13	.12	.11
24 Pin	.15	.14	.13	.12
28 Pin	.19	.17	.15	.14
40 Pin	.25	.24	.22	.20

Plus 20% tax where applicable

VOLTAGE REGULATORS

	10+	100+	1000+
7805uC	.45	.44	.43
7805KC	1.50	1.40	1.20
7812uC	.45	.44	.43
7815KC	1.50	1.40	1.20
7818uC	.50	.49	.48
7818KC	1.50	1.40	1.20
7905uC	.70	.60	.55
7912uC	.70	.60	.55
uA323KC	4.50	3.90	3.75
78H12	7.00	6.00	5.90
78HGKC	7.50	6.50	6.00
79HGKC	16.50	16.00	14.00
78P05	11.50	11.00	10.50
78P12	14.00	13.50	13.00

Plus 20% tax where applicable

BRIDGES

	10+	100+	1000+	10K+
6A 400V	1.00	0.80	0.75	0.69
W02	0.24	0.23	0.20	0.18
W04	0.25	0.24	0.21	0.19
NEW MDA3504 BRIDGE!				
35A 400V	3.50	2.90	2.75	2.50

Plus 20% tax where applicable

IDC SOCKETS

		1-9	10+	100+
P12100	10 Pin Socket	1.95	1.75	1.25
P12101	16 Pin Socket	2.25	2.05	1.65
P12102	20 Pin Socket	2.45	2.25	1.90
P12104	26 Pin Socket	2.65	2.45	2.00
P12106	34 Pin Socket	2.75	2.55	2.15
P12108	40 Pin Socket	2.95	2.75	2.25
P12110	50 Pin Socket	3.50	2.95	2.50

Plus 20% Sales Tax where applicable

IDC CONNECTORS

		1-99	100+
P12114	14 Pin Dip Plug	0.80	0.75
P12116	16 Pin Dip Plug	0.75	0.70

Plus 20% tax where applicable

NEW SWITCHES

Right angle P.C.B. mounting

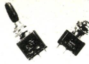
	10-99	100+
SPDT Cat. S11040	1.00	.95
DPDT Cat .S11042	1.20	1.00

Plus 20% Sales Tax where applicable

TANTALUM CAPACITORS

Cat. No.	Description	10+	100+
R16124	4.7uF 16V	$0.24	$0.18
R16125	10uF 16V	$0.25	$0.23
R16126	15uF 16V	$0.38	$0.36
R16128	22uF 16V	$0.42	$0.40
R16132	47uF 16V	$1.55	$1.20
R16134	68uF 16V	$1.80	$1.50
R16220	4.7uF 16V	$0.35	$0.33
R16224	10uF 16V	$0.38	$0.37
R16228	22uF 16V	$1.20	$1.00
R16300	0.1uF 16V	$0.13	$0.12
R16302	0.15uF 16V	$0.13	$0.12
R16304	0.22uF 16V	$0.15	$0.12
R16306	0.33uF 16V	$0.15	$0.14
R16308	0.47uF 16V	$0.15	$0.14
R16310	0.68uF 16V	$0.16	$0.15
R16311	0.82uF 16V	$0.18	$0.15
R16312	1uF 16V	$0.15	$0.12
R16314	1.5uF 16V	$0.24	$0.20
R16316	2.2uF 16V	$0.24	$0.23
R16318	3.3uF 16V	$0.29	$0.27
R16320	4.7uF 16V	$0.35	$0.33

30% Sales tax where applicable



ECONOMY TOGGLE SWITCHES

Unbelievable Value!

	10-99	100+
S11010 (SPDT)	0.70	0.60
S11020 (DPDT)	0.90	0.80

Plus 20% Sales Tax where applicable

QUALITY MOMENTARY (RED BODY)

	10-99	100+
SPDT Cat. S11050	1.00	.90

Plus 20% Sales Tax where applicable

19" RACK MOUNT CASE

Tremendous value! Vented.
Dimensions: 480(W) x 134(H) x 250(D)mm.

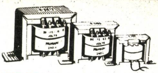
1-9	10+
$32.00	$29.50

Plus 20% tax where applicable

DIP SWITCHES

	10+	100+	1000+
S13402 2 Way	.70	.65	.60
S13404 4 Way	.80	.75	.70
S13405 5 Way	.90	.85	.80
S13407 7 Way	1.10	1.00	.95
S13408 8 Way	1.20	1.10	1.00

20% Sales tax where applicable



TRANSFORMERS

Cat No.		1-99	100+	1000+
M12851 240V 12-6V CT 150mA	2851	2.50	2.25	1.90
M12155 240V 6-15V 1A tapped	2155	4.80	4.10	3.70
M12156 240V 6-15V 2A tapped	2156	6.35	6.15	5.95
M16672 240V 15-30V 1A tapped	6672	6.35	6.15	5.95

Plus 20% tax where applicable

NEW TRANSFORMER!

M12860 240V to 15V C.T. at 250mA	2860	3.00	2.50	2.20

Plus 20% tax where applicable

"BEAT THE DOLLAR DEVALUATION WITH RITRONICS WHOLESALE!"

HOOK UP WIRE

Cat. No. Description
W11251 13/.12 TND BLK
W11252 13/.12 TLD BROWN
W11253 13/.12 TLD ORANGE
W11254 13/.12 TLD YELLOW
W11255 13/.12 TLD GREEN
W11256 13/.12 TLD BLUE
W11257 13/.12 TLD WHITE

PRICES PER 100 METRE ROLL

1-9	10+
$3.50	$3.00

Plus 20% tax where applicable

W11260 14/.20 RED
W11261 14/.20 BLACK
W11265 14/.20 BLUE
W11268 14/.20 WHITE

PRICES PER 100 METRE ROLL

1-9	10+
$9.00	$7.00

Plus 20% tax where applicable

W11270 24/.20 RED
W11272 24/.20 BLACK
W11274 24/.20 GREEN

PRICES PER 100 METRE ROLL

1-9	10+
$11.00	$10.00

Plus 20% tax where applicable

W11280 32/.2 BROWN
W11282 32/.2 BLUE

PRICES PER 100 METRE ROLL

1-9	10+
$12.00	$11.00

Plus 20% tax where applicable

RAINBOW CABLE

Cat.No.	Description	1-29 mtr	30+ mtr
W12714	28AWG 14W per metre	$0.90	$0.70
W12716	28AWG 16W per metre	$0.90	$0.70
W12720	28AWG 20W per metre	$1.20	$1.10
W12726	28AWG 26W per metre	$1.60	$1.50
W12734	28AWG 34W per metre	$1.90	$1.80
W12740	28AWG 40W per metre	$2.20	$2.00

Plus 20% tax where applicable

ENCLOSED ROTARY SWITCHES AT SPECIAL PRICES!!

		1-9	10+	100+
S13021	SW ROT 1P 12Pos	1.00	.80	.70
S13022	SW ROT 2P 6Pos	1.00	.80	.70
S13033	SW ROT 4P 3Pos	1.00	.80	.70
S13035	SW ROT 3P 4Pos	1.00	.80	.70

Plus 20% Sales Tax where applicable

CANNON TYPE ADUIO CONNECTORS

We've sold 1000's because of their great value!

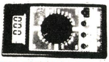
	1-9	10+
3 Pin Line male Cat. P10960	1.80	1.60
3 Pin Chas male Cat. P10962	1.90	1.70
3 Pin line female Cat. P10964	2.50	2.20
3 Pin Chas FMle Cat. P10966	2.90	2.50

Plus 20% Sales Tax where applicable

10W P.A. SPEAKERS TWIN CONE

1-9	10+	100+	300+
$5.00	$4.75	$4.50	$4.00

Plus 20% tax where applicable



YU-FONG YFE-1030C

Features:
- Large 3½ digit display. (½ inch high)
- Autopolarity, "-" display for Negative input.
- High over-load protection for all ranges.
- Over-load display highest figure "1" or "-1" alone glows.
- Power consumption 20mW approx.

Cat. Q126030

1-99	100+
43.95	34.00

Plus 20% Sales tax where applicable

CARD EDGE CONNECTORS

Edge Connectors to Disk Drives Etc.

	10-24	25-99	100+
P12060 10 Way Card Edge Con	2.95	2.50	2.10
P12062 20 Way Card Edge Con	3.25	2.75	1.95
P12064 26 Way Card Edge Con	3.55	2.95	2.20
P12066 34 Way Card Edge Con	3.95	3.50	2.30
P12068 40 Way Card Edge Con	4.50	3.90	3.50
P12070 50 Way Card Edge Con	5.50	4.50	3.90

Plus 20% Sales Tax where applicable

NICADS

Cat No.		1-99	100+	250+
S15020	AA	1.60	1.50	1.40
S15021	C 1.8AH	5.25	4.90	4.80
S15022	D 4.0AH	7.90	7.50	7.20

Plus 20% tax where applicable

SEALED LEAD ACID BATTERY 12V 1.2 AH

	1-9	10-99	100+
S15029	12.50	11.00	10.50

Plus 20% tax where applicable

FANS

		1-9	10+	100+
Cat. T12461	240V 4½"	10.50	10.00	8.00
Cat. T12465	240V 3½"	10.50	10.00	9.00
Cat. T12463	115V 4½"	10.50	10.00	8.00
Cat. T12467	115V 3½"	10.50	10.00	9.00

(Fan guards to suit also available)
Plus 20% tax where applicable

LEDS 5mm STANDARD

	10+	100+	1000+
Red	$0.10	$0.09	$0.08
Green	$0.15	$0.10	$0.09
Yellow	$0.15	$0.10	$0.09

Plus 20% tax where applicable

DATA CASSETTES

Check our low prices on these quality tapes!

1-9	10-99	100+
$0.75	$0.70	$0.65

Plus 20% tax where applicable

TELEPHONE CABLE (200 METRE ROLLS)

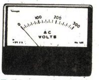
		1-9	10+
W11302	2 Pair	24.00	23.00
W11303	3 Pair	36.00	34.00
W11310	10 Pair	120.00	115.00

Per 200m Roll
20% Sales tax where applicable

75OHM COAX CABLE

Cat No.	100M	500M	1000M
W11222 3C2V	18.00	17.00	16.00
W11224 5C2V	27.00	25.00	24.00

(5C2V WHITE OR BLACK)
100M ROLLS
LINE LOSS PER 100' (33M 200MHz)
W11222 6.2dB (Approx)
W11224 3.9dB (Approx)
Plus 20% tax where applicable



PANEL METERS

		1-9	10+	100+
Q10500	MU45 0-1mA	6.95	6.75	6.50
Q10502	MU45 50-0-50uA	6.95	6.75	6.50
Q10504	MU45 0-100uA	6.95	6.75	6.50
Q10505	MU45 0-50uA	6.95	6.75	6.50
Q10510	MU45 0-5A	6.95	6.75	6.50
Q10518	MU45 0-1A	6.95	6.75	6.50
Q10520	MU45 0-20V	6.95	6.75	6.50
Q10535	MU45 VU	7.95	7.75	7.50
Q10530	MU52E 0-1mA	9.95	8.35	
Q10533	MU52E 0-5mA	9.95	8.35	
Q10538	MU65 0-50uA	9.35	8.95	8.75
Q10540	MU65 0-1mA	9.35	8.95	8.75
Q10550	MU65 0-100uA	9.35	8.95	8.75
Q10560	MU650 0-20v	9.35	8.95	8.75

Plus 20% tax where applicable

RITRONICS WHOLESALE

Incorporated in Victoria
Pty. Ltd.

56 Renver Road, CLAYTON, 3168, VICTORIA, AUSTRALIA. Phone (03) 543 2166 (3 lines) Telex: AA151938

Minimum account order is $50, minimum cash sale is $25. Minimum post/pack $3.00. Minimum account post/pack $5.00. Comet Road Freight, bulky items and/or over 10Kg is extra.
Bankcard, Visa and Mastercard welcome.

Errors and Omissions Excepted.

Artificial intelligence

FORUM

Conducted by Neville Williams

Once considered impossible, the idea of artificial intelligence has gained credibility of late, to the point where it is now commonly assumed to be "just around the corner". Today the super-computer; tomorrow an intelligent, thinking, "humanoid" electronic brain. Now seems as good a time as any to question and debate that much too facile assumption.

I'd been considering, for some time, the idea of discussing the matter and, in the wake of a "Beyond 2000" TV program on artificial intelligence, it needed only a phone call from a technical friend to get me started. If I can condense his observations into a few formal paragraphs, they would translate into something like this:

You've talked about many topics in "Forum" over the years but I can't recall any discussion of "intelligent computers" or "electronic brains" — both very questionable concepts, to my way of thinking.

Not so long ago, technical writers were fond of branding calculators and computers as "electronic morons" — adept at what they had been programmed to do, but devoid of other initiatives. More ambitious computers and programs notwithstanding, I don't see that the situation has changed all that much.

Yet, nowadays, the latest typewriters, terminals and other whatnots are repeatedly described as "intelligent", while family cars are not considered modern unless their various functions are monitored by an on-board "electronic brain".

As for computers, periodic advances in chip capacity, speed and architecture tend to be interpreted by feature writers as steps towards that automatic and ultimate goal: an intelligent, reasoning replica of the human brain!

If the human brain was simply an organic repository and process of formalised information, the idea mightn't be too far-fetched. What the writers conveniently overlook is that the human brain gathers, correlates, interprets and communicates such information by means of senses and faculties which computerised contrivances can as yet imitate in only the most primitive fashion — even if at all.

They are flat out coping with a limited vocabulary of spelled-out words, let alone with often poorly organised and poorly vocalised ideas, unclear pronunciation, ambiguities, inflection, emphasis, gestures and so on — familiar elements of everyday conversation, which even a child soon learns intuitively to cope with.

Again, the human brain is subject to a variety of complex emotions; it imposes constraints which we broadly categorise as morality and/or conscience, and responds to religious, super-natural or spiritualistic stimuli of an arguably non-physical nature.

While a computer design team may choose to discard such qualities as too-hard, inappropriate, spurious or redundant, the fact remains that a supposedly "intelligent" electronic "brain" without them would be reminiscent more of science fiction's Mr Spock, than of authentic terrestrial mortals!

For sure, the technological achievements of the computer industry are mind-boggling but please: a little more realism as to where we are at and in which direction we are headed.

Maybe we need some new words in our language or more discerning use of the old ones to counter some of the current speculation, misinformation and misunderstanding as to what computers are all about.

M. N.
(Thornleigh, NSW)

Thanks M.N. for your timely and interesting contribution.

I guess that most of us are aware of the description "moron", as applied to a calculator or computer. Faced with their speed and accuracy, compared with our own often sluggish mental responses, it can be reassuring, in a negative kind of way, to draw attention to their otherwise limited initiative and "think" power.

But, with the ever expanding capabilities of computer based equipment, the "moron" tag has become progressively less convincing even if, as M.N. maintains, it is still strictly true. How can something so adept still be a moron?

Marketing and advertising people certainly find no difficulty, these days, in boasting to good effect about their company's "smart" or "intelligent" whatnots, as a way of dramatising the advantages of new models compared with the old.

"Smart" is a fairly neutral term but "intelligent", and other words sharing the same root, have long-standing connotations linking them firmly with the human brain. Look them up in an older dictionary and you'll see what I mean:

INTELLECT: That mental faculty which receives ideas; the understanding; mental power; the mind.

INTELLIGENCE: The capacity to know; an intelligent or spiritual being.

INTELLIGENT: Endowed with the faculty of understanding or reason; endowed with a good intellect; well informed.

To a person with that kind of verbal conditioning, talk of an "intelligent computer" may very easily be assumed to mean one which exhibits basic characteristics resembling those of a human intellect (or mind or brain) — certainly an intriguing notion but one that owes more to promotional hype than to reality at this point in time.

Unfortunately, it is difficult to suggest alternative terms which are free of the "human" connotation. Short of inventing new words, we have little choice but to broaden by usage the meaning of the old ones — a familiar trick in the English language.

In fact, this has already occurred with "intelligence" and "intelligent", as reference to the Macquarie Dictionary will show. (Not so for "Brain", which is

— Who's kidding whom?

still defined only as: "the soft, convoluted mass of greyish and whitish nerve substance which fills the cranium of man and other vertebrates.")

INTELLIGENCE: 1. capacity for understanding and for other forms of adaptive behaviour; aptitude in grasping truth, facts, meaning, etc . . . 8. the capacity which a computerised machine derives from programs built into it to recognise specified conditions and perform non-constant functions independently of an operator.

INTELLIGENT: 1. having a good understanding of mental capacity; quick to understand as persons or animals. . . . 4. of or pertaining to a computerised piece of machinery which is programmed to recognise specific sets of conditions and to carry out non-constant functions independently of an operator.

Those two definitions, at least, fit in with M.N.'s call for "more discerning use" of established words. But they also support his observation that more ambitious hardware and software notwithstanding, "the situation hasn't changed all that much".

Modern computers and "computerised machines" can certainly access, process and respond to vastly more data than once was possible. They can make more complex decisions and control more complex functions but their areas of expertise are still "specific" and still need to be organised and programmed by humans.

In short, they're still "electronic morons", although they are impressively capable morons!

"Brains" ain't brains!

For reasons such as those suggested by M.N., there is far more to simulating a real human intellect or brain than the revolutionary architecture and the copious high-speed memory and logic that characterises even the latest and much vaunted "5th generation" computers.

Merely to upgrade their sensing and communication potential to anything like human standards would provide scope for research projects, these and doctorates, for years to come. As one authoritity remarked in "Beyond 2000": for all practical purposes, today's best computers are still "blind, deaf, mute and passive!"

Beyond that would lie the job of researching and defining the complex emotions, foibles, passions and convictions of a human mind, and translating them into credible behavioural programs capable of being superimposed on whatever else is fed into the artificial "brain".

(That leads, incidentally, to the notion of deliberately accentuating certain "emotions, foibles, passions and convictions" to recreate one's own hypothetical Hitler or Schweitzer — surely the ultimate in academic "games"!)

That aside, the task ahead of a scientist aspiring to create a humanoid brain might be summed-up by a proposition credited to computer pioneer Alan Turing: that a "computer machine" at the far end of a telephone line would qualify as "intelligent" if its spoken responses to ordinary conversation could not be distinguished from those of a human being.

That sort of electronic brain is not just around the corner; it's a long way down the track! And while it may exist as a hypothetical goal, it does so on the basis that: if we can accomplish that, we will have established our ability to do other things with more immediate applications.

Non-humanoid brains:

For the present, the more practical and useful artificial brain will be (or is) of a candidly and deliberately non-humanoid variety; capable of being programmed to accommodate and interact with a mass of structured information relating to some specific field, but unaffected by lapses of memory, mental "indigestion", emotions, prejudice, oddball reactions and other human traits.

In so saying, I may appear to have completed the full circle back to a sort of "Spock machine" — an electronic brain installation into which one could feed suitably organised information on specific subjects and have it evaluated quickly, accurately and dispassionately.

I jest, of course, but something akin to my "Spock machine" is already emerging in the guise of "expert" computer systems — a less colourful description than "intelligent" but one that is more appropriate and less likely to be exploited and misunderstood.

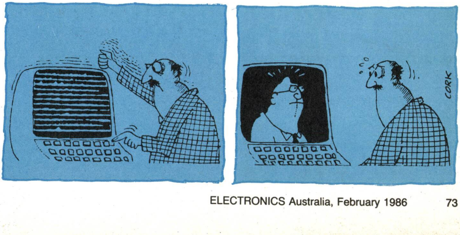
An "expert" system might be defined as one which can be programmed to analyse and correlate information in much the same way as would human experts, except that the expert system can arrive at the answer dispassionately and much more speedily.

In "Beyond 2000", Dr Trevor Pearcy of the Chisholm Institute of Melbourne explained an expert system as a "tool to aid our own thinking".

Indeed, that's what came through in the program, despite a certain preoccupation with ultimate humanoid "intelligence". Expert systems were shown being programmed and used in environmental, medical and military situations, to perform tasks — in this case process data —at the behest of humans, more effectively than they could do unaided.

I guess that's true of just about any "tool" from a stone-age axe onwards. Essentially, the so-called "5th generation" computers offer a better kind of axe than the ones we've had to date. They'll also be much more expensive, leading to the billion dollar commercial heart of the matter: whether they'll be purchased from American, European or Japanese consortia!

Incidentally, if the term "expert" is still not to your liking, an alternative industry buzzword is the acronym IKBS, short for "Intelligent Knowledge-Based System". It does, of course, reintroduce



CB SAVINGS...

Emergency Hand-Held

A light, compact go-anywhere CB that's ideal for bushwalkers. Features 'bushwalking' and 'safety' channel 27.620 MHz for instant response to emergency situations. You can't afford not to have one-...and now it's $10 off!!

DOC Approval No. 242H0108

SAVE $10

Was $99

NOW $89

Budget Priced Walkie Talkies

Pocket Com II — effective short-range communicators small enough to fit a pocket. Ideal for kids games ... and Mum can use one to call them for dinner. Yet they're powerful enough to use on construction sites to save time and trouble. At this price, buy a couple. Cat D-1101

Complies with DOC Specification RFME001

$12.95 each

$100 off! Get into the action with a hand-held scanner ...

Tune into news and events as they happen ... all the action up to 525 MHz (including air) with our Regency HX-2000 scanner. Compact hand-held size means you take it anywhere: use it in the car to avoid traffic snarls. It's small, but big on features: priority, scan and search ensures you won't miss a thing. Plus 20 channel memory and more. And now it's even a greater bargain .. SAVE $100! Cat D-2815

Was $449 NOW $349

FOR YOUR OWN SAFETY, MARINE TRANSCEIVER

3W 3-CH CB Transceiver

Save $30 on a handy medium-powered communicator-just in case emergencies. Fitted with one CB channel. Cat D-1106
DOC Approval No. 249A072

Was $129 NOW $99

SAVE $100

Programmable VHF Transceiver

WOW! Now you can have VHF marine without your budget taking a dive! Programmable 12 channel capacity provides access to all local area communications. But if you cruise the coast, then re-program — it's simple. Features switchable 0.5/2.5W power output and very high sensitivity: better than 0.25uV (12dB SINAD). And its compact, hand-held size means you can take it anywhere. Cat D-1404

DOC Approval No.274C018

Was $399 NOW $299

ACCESSORIES

CB ANTENNAE

Heavy Duty CB Helical — 27MHz

Tough fibreglass antenna for truckies, off-road enthusiasts, etc. Provides that extra range when you need it. Features sealed base with connector for immediate use.
Cat D-4078

$99

UHF Co-ax Base

Mobile base that provides low loss for maximum efficiency. Ideal for use with antenna D-4013 (this page).
Cat D-4516

$6.95

CB UHF 4.5 High Gain Mobile

Great value for this high gain mobile! Gives that 'extra' range when it counts. 4.5 dB gain doubles output.
Cat D-4013

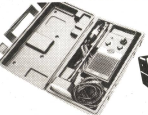
$12.50

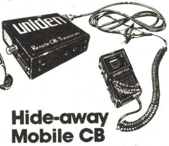
CB UHF Base Antenna

High gain antenna covering the 477MHz range with an impressive 4.5dB gain.
Cat D-4012

$49.95

LOOK! NEW CB TRANSCEIVERS





40-CH AM 'Emergency' CB

If you're not into full time CB but appreciate the safety aspect, then this compact 40-Ch mobile CB is ideal. Comes with a carry case: the CB, antenna and accessories stay there until an emergency occurs. The antenna features a magnetic base for instant set up. In no time you'll be on the air calling for assistance.
Cat D-1172

$149

UHF 'Sundowner'

The pick of the crop! UHF FM communication on 40 channels that's as clear as country air. Backed by superior, reliable features: squelch, duplex repeater, RX/TX LEDs and more.
Cat D-1806

$375

Hide-away Mobile CB

Brilliant! Fool thieves by concealing CB almost anywhere — in the boot, glove box. And it's great for crowded dashes — only the hand-set need be mounted. All control functions are located in the hand-set: PTT mic, rocker-switch UP/DOWN channel selection plus volume and squelch controls. Provides access to 40-Ch covering 26.965-27.405MHz range.
Cat D-1441

$299

DICK SMITH ELECTRONICS PTY LTD

For Address details See P98

B.110/RB

that ambiguous word "intelligent" but only a machine could ever be thought of as an IKBS!

You don't like IKBS either? Well, I noticed the title "Personal Sequential Inference Processor" on the panel of one of the Japanese 5th generation pilot production models. So how about a PSI?

Problems with a "wireless" microphone

Dear Mr Williams,

Thanks for the article "A guide to correct microphone usage". It prompts me to relate a tale of woe which other readers may find interesting.

Some months ago, I ran a public speaking contest for Toastmasters, an amateur (but not novice) organisation which teaches and promotes public speaking (no mumbling, etc). In this case, the contestants had to address an audience of about 300 people.

The hall was fitted out with a 4-channel audio system, fed from two cable mics and two FM radio mics (each feeding a separate FM receiver). In turn, the amplifier fed a column loudspeaker in each corner of the hall, which was very "live" because of the polished wooden floor and long refectory tables.

One radio mic was a hand-held type (for business sessions), the other being a lapel unit for the competition speakers. On the first night of the contest, the mics were checked out before the arrival of the audience, levels were set and all seemed well.

In due course, the hall filled to capacity and the meeting was called to order on the roving radio mic, with no hint of any problem.

The first contestant clipped on his lapel radio mic and proceeded to speak. His voice rang out clearly . . . then silence . . . boomed out again . . . went soft . . . and so on. It sounded like an intermittent loss of amplifier gain but other nervous speakers seemed oblivious of the fault. The contest was a disaster!

The gear was tested next morning and worked much as it had done during the initial checkout. And therein lies the rub. During that initial check, we hadn't been looking for barely perceptible changes in volume, but they were there.

What had happened was apparently this: The distance from the mic to the receiver was a couple of dozen (radio) wavelengths. When the contestant stepped back, the RF signal went from adequate strength to a null. The difference may have amounted to only a few dB and, in the empty hall, with lots of audio (and some radio) reflections, the loss was barely discernible. But, with the hall full of energy absorbing bodies, the radio and audio loss was catastrophic.

In the case of a speaker gripping a lectern, or TV interviewees glued to a chair, a radio mic serves the speaker well; he/she can't move. But, for a speaker who takes a step back to emphasise a point, a radio mic can let them down badly.

Maybe other readers may be able to recount similar P.A. system catastrophies.

R.B. (Canberra, ACT).

PA system "catastrophe"

By way of a complete change of subject, a reader from Canberra recounts a tale of woe involving a public address system, which would have to be a classic case of "red faces all around". I suggest you read his letter in the accompanying panel.

While I've had only limited experience with FM radio (or "wireless") mics, my initial reaction was simply to agree with the writer's diagnosis and to leave it at that.

But on reflection I soon realised that, in everyday situations, speakers typically enjoy considerable freedom of movement without anything like the trauma described by R.B. His had to be a special case.

From what I've observed, much the greater risk is that of the person wearing the microphone inadvertently straying too close to the loudspeaker system and causing acoustic feedback. They quickly learn not to do it again!

My tip is that R.B.'s problem did have to do with an RF peak/null situation as described but that it was aggravated by insufficient signal strength to begin with. This could have resulted from lower than normal RF output from the particular mic transmitter or perhaps low battery voltage, such that the system simply could not cope with any further loss of level.

The end result would be reminiscent of the dropouts that occur in FM reception when one is driving near the fringe of the station coverage.

In this context, it should be pointed out that, with a lower than normal signal level, the setting of the receiver muting becomes quite critical. If set too fine, a burst of noise may be heard when the incoming signal is severely reduced or interrupted. If set too far the other way, the receiver may mute prematurely and interrupt an otherwise acceptable signal.

R.B. does not mention the type of receiver or tuner being used with the microphones but I do wonder whether the muting level had something to do with the magnitude of his problem.

One other point worth mentioning is that not all wireless mics are as stable as they should be in terms of frequency, being sensitive in some cases to the "dress" of the antenna. A shift in frequency with each movement of the speaker can produce not only a variation in the level of the signal, as received, but also a sharp rise in distortion.

One other point in R.B.'s letter invites comment, namely his reference to the speaker's voice going "soft" as distinct from "silence".

Whereas silence would be accounted for by complete signal dropout, going soft could suggest that the speakers were also falling foul of another characteristic of lapel or necktie microphones.

For sure, you can't walk away from them but you can turn the head aside, or shadow them with a hand or arm, or knock them askew. Particularly in marginal situations, a loss of level or a loss of treble response from such causes can seriously reduce intelligibility.

Like other microphones, the clip-on variety have their uses — and their abuses!

R.B. suggests in closing that other readers may like to recount similar stories of P.A. system experiences and catastrophies. A good suggestion R.B.; it could undoubtedly provide some diverting reading.

★★★★★★★★★★★★★1986 KIT LINEUP

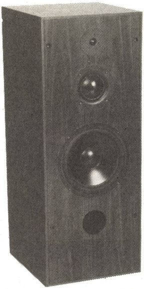
10" 3-WAY SPEAKER KIT

AEM6103
Ref: Aust Electronic
Monthly Jan '86

We have all components for this system ex-stock. Check details below:

10" Woofer Cat. CW2136 P25WO $149 ea
3" Mid-range Dome CM2086 D75MX $89 ea
19mm Tweeter Cat. CT2019 D19TD $38 ea
CX.2634 3-WAY CROSSOVER AS SPECIFIED $119 ea

Introductory Special: Buy the complete stereo system for $750 — save $40



Complete wooden cabinet kit for 3 way system (to AEM specifications). Sides in black vinyl with "woodgrain" texture with matching grey baffle screen, port tube etc.

Cat. CC2815

Only $248 per pair!

NEW KITS FROM "AUSTRALIAN ELECTRONICS MONTHLY"

AEM 6010 Ultra Fidelity Preamp

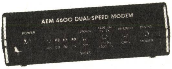
Ref: AEM Oct - Nov 1985

We now have stocks of this project in kit form including the original case, components etc. Nothing else to buy! Chassis is pre-punched with original front panel.

Cat. KM-3030

ONLY $269.00

AEM 4600 Dual Speed Modem



Ref: AEM December 1985

This is the ultimate kit modem. Dual 1200/300 Baud, case etc all included.

Cat. KM-3040

ONLY $169.00

NEW 145 Watt Mosfet Amp

Ref: EA October 1985

This is the high power mono Mosfet amp version of the Playmaster 200. The shortform amp kit includes all parts except the heatsink extrusion/bracket which is available separately.

Cat. KA-1622

ONLY $89.50

Hands-Free Telephone Adaptor

Ref: EA November 1985

Jaycar now has stocks of this superbly designed project. Call in and check it out now! Note: this unit is ORIGINAL to the design.

Cat. KA-1640

ONLY $79.00

★★★ SPECIAL

FULLY IMPORTED 'POWERTRAN' MIDI-CONTROLLED SAMPLER - see review in August 1985 Sonics
KIT VERSION **$800**
BUILT VERSION **$1,000**
UNDER ½ PRICE

NEW CD Attenuator

Ref: EA January 1986

This project enables you to dub from a compact disc to a cassette without overloading. It attenuates the signal to accomodate the smaller dynamic range of the cassette medium. Kit includes case.

Cat. KA-1624

ONLY $7.95

NEW Video Fader

Ref: EA January 1986

Fades video signal to black and up again without loss of sync. PCB project. Plugpack and box extra.

Cat. KA-1626

ONLY $19.95

NEW Mini FM Transmitter

Ref: ETI

Great stable and compact FM transmitter. Tiny!

Cat. KE-4711

ONLY $8.95

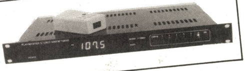
NEW AM-STEREO/FM-STEREO WIDE BAND TUNER

Ref: EA Dec/Jan onwards

What can I say - it's a world beater. If you want THE BEST at any price. We will not have the kit in stock in January (due to metalwork delays over Xmas) but it should be available mid-end Feb.

Cat. KA-1635 INTRODUCTORY PRICE

$399 COMPLETE *Remote extra.*



Bench Type Digital Capacitance Meter

- Ref: EA August 1985 - measure from 1pF to 99.9uF with this handy piece of equipment.

Cat. KA-1595

ONLY $79.95

"VIFA" 8" 2 WAY SPEAKER KITS

See AEM magazine in August

TWEETER D25TG Cat. CT-2020
$59.95 ea $119/pair
WOOFER P21WO Cat. CW-2132
$149 ea $298/pair
CROSSOVER NETWORK
Not a kit, now a factory built precision unit.
Cat. CX-2630
$69.95 ea $139/pair
TOTAL PRICE $557.90
SPECIAL PACKAGE PRICE $499
SAVE $58.90!!

Complete wooden cabinet kit. Black vinyl sides, "woodgrain" texture with matching grey baffle screen, port tube etc.

Cat. CC2810

Only $148 per pair!

☆ ☆ NEW ☆ ☆ Motor/Gearbox Kit

This fantastic new kit enables you to produce a shaft speed between 3 and 2,000 RPM!
It uses a small DC motor with a 'modular' gearbox attached. You are supplied with gear wheels, spacers etc to configure your gearbox to almost any speed within the 3-2,000 RPM range. Measures only 48(H) x 25(W) x 37(D)mm (not including output shaft)
Cat. YX-2600

ONLY $14.95

MAIL ORDER HOTLINE (02) 747 1888

"PEST OFF" Ultrasonic Pest Repeller

Ref: EA November 1985

A mozzie season special. See November EA for more info.

Cat. KA-1620

ONLY $44.50

— UNBEATABLE!!★★★★★★★★

NEW Low cost Robot Kit

Ref: EA January 1986

This is a true 5-axis pick and place robot with substantial payload capability that you can connect direct to your P.C.! But the best feature is THE PRICE! You can build the mechanical kit which includes motors, bearings, arm components, pulleys etc for just $189! The full construction manual is just $10 extra. The motor drive electronics, computer interface and power supply are also available.

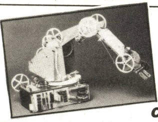
COMPLETE MECHANICAL ROBOT KIT Cat. KA-1625

ONLY $189.00

COMPLETE CONSTRUCTION MANUAL Cat. BI-8015

ONLY $10.00

Call in to any Jaycar store or watch next months ads for further details.



POSITION DETECTOR/ ENCODER Kit.

$29.95

Cat. KA1628

DWELL/TACHOMETER

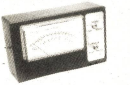
Ref: EA Sept. 1985

Tune up your car quickly and easily with this handy piece of gear. The Jaycar kit includes case, large meter and Scotchcal meterscale.

Cat. KA-1612

ONLY $36.95

Suits 4-6 or 8 cylinder cars



☆ ☆ NEW ☆ ☆
300 WATT INVERTER WITH AUTO START

NOT A KIT - BUILT, TESTED & GUARANTEED

This is the built version of the "Electronics Australia" September 1985 project!

Just think how handy it would be to have 240 volts AC mains power when camping, or for your boat or caravan - well this brilliant new design is the answer. ● Super compact - tough ABS case ● Uses high efficiency toroid transformer which keeps the weight down, battery drain and heat dissipation ● Auto start draws power from your battery on when appliance is plugged in and 'turned on' i.e. battery can be left permanently connected ● Thermal overload automatically shuts down if/when output stage is overheated (through high ambient temperature and high load or combination thereof - automatic reset ● Current regulated inverter ensures the unit is being used within designed overload limits ● Current overload unit self limits - LED indicates overload condition.

COMPLETE KIT VERSION
Cat. KA-1610

ONLY $199.00

FULLY BUILT & TESTED
Cat. MI-5000

ONLY $249.00

★ NEW ★ NEW ★
ELECTRIC FENCE CONTROLLER

Ref: EA December 1985

High power and lower current drain. No auto coil needed. Compact and all parts included.

Cat. KA-1660

ONLY $45.00

WARNING!

ELECTRIC FENCE

ELECTRONICS AUSTRALIA

MAIL ORDER HOTLINE (02) 747 1888

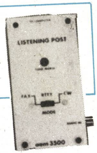
AEM 3500 'The Listening Post'

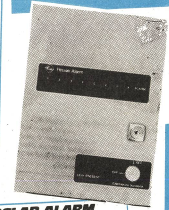
Ref: July 1985

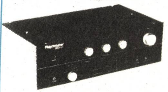
Decode all that info on your short wave radio to show Morse code, RTTY, weather maps etc. Wonderful!!! (A personal computer is required).

Cat. KM-3015

ONLY $37.50







PLAYMASTER SERIES II MOSFET AMP KIT

Ref: EA Jan/Feb/March 1985

". . . s stereo amplifier that will equal or better just about any integrated commercial amplifier, regardless of price". Leo Simpson, Editor of EA, February 1985.

MAIN FEATURES

- Switchable phono input for MM and MC cartridges
- Electronic signal switching
- Full facilities for dubbing between two cassette decks
- Monitor loop for either of two cassette decks or a signal processor
- Click action pushbutton switches for selection of sources, dubbing and tape monitor with LED status indicators.
- Centre detents on bass, treble and balance controls, multiple detents on volume control
- Heavy duty heatsinks
- Power transformer for low hum and noise
- Easy to build - all parts except power supply mount directly on the two printed circuit boards; wiring has been kept to an absolute minimum
- 100 watts RMS per channel into 8 ohm load
- Less than 0.01% total harmonic distortion

Cat. KA-1500

ONLY $439.00

8 SECTOR BURGLAR ALARM

Ref: EA Jan/Feb 1985

Why buy a commercially made up unit for more when you can buy this kit and SAVE money! A unique feature of this kit is the fact that you can wire N/O and N/C alarm sensors ON THE SAME LINE. ★ 8 SECTORS ★ 2 delayed entry sectors ★ steel box ★ includes battery and siren driver in the price ★ variable exit and entry delays.

Cat. KA-1580

ONLY $149.00

AEM 6500 - 60/120 WATT UTILITY MOSFET AMP MODULES

Ref: AEM July 1985

This is a low cost high performance design using proven MOSFET technology. A single pair of (2SJ49/2SK134) Mosfets will deliver up to 60 watts output. Another pair may be added for 120 watt performance. The module has been designed to fit into a large variety of commonly stocked instrument cases and rack boxes. It features VERY LOW distortion and impeccable transient performance. It is unconditionally stable and virtually blow-up proof. It can be powered from common transformer/rectifier/-capacitor combinations. A Winner!

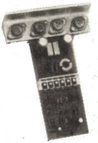
As usual, the Jaycar kit reflects a quality approach. All specified components for each version are included.

60 WATT MODULE Cat. KM-3010

ONLY $55.00

120 WATT MODULE Cat. KM-3012

ONLY $65.00



AEM 9500 Beat Triggered Strobe

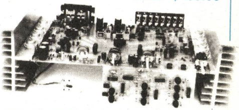
Ref: AEM July 1985

This project provides a very bright stroboscopic effect for parties, discos, etc., but with an ADDITIONAL FEATURE! This strobe will actually flash in synchronisation with the music!

The Jaycar kit includes case, photographic reflector, flash tube etc.

Cat. KM-3018

ONLY $59.00



Jaycar ELECTRONICS

Incorporating ELECTRONIC AGENCIES

Carlingford, Hurstville, Gore Hill, Brisbane - Mon-Fri 9am - 5.30pm
Sydney and Concord - Mon-Fri 8.30am - 5.30pm
Sydney, Carlingford, Hurstville - Thursday nights until 8.30pm
Brisbane - Thursday night until 8pm
Sydney, Carlingford, Hurstville, Brisbane - Saturdays 9am - 12 noon
Gore Hill - Saturday 9am - 4pm
CONCORD NOT OPEN ON SATURDAYS

NUMBER 1 FOR KITS

N.S.W. SHOWROOMS
SYDNEY: 117 York Street. Tel: (02) 267 1614
CARLINGFORD: Cnr. Carlingford & Pennant Hills Road. Tel: (02) 872 4444
CONCORD: 115/117 Parramatta Road. Tel: (02) 745 3077
HURSTVILLE: 121 Forest Road. Tel: (02) 570 7000
GORE HILL: 188/192 Pacific Highway (Cnr Bellevue Avenue) Tel: (02) 439 4799

QUEENSLAND
BURANDA: 144 Logan Road. Tel: (07) 393 0777

MAIL ORDERS: P.O. Box 185, CONCORD 2137

HEAD OFFICE: 115-117 Parramatta Road, CONCORD 2137
Tel: (02) 747 2022 Telex: 72293

POST & PACKING

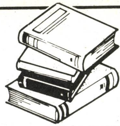
$5 - $9.99	$2.00
$10 - $24.99	$3.75
$25 - $49.99	$4.50
$50 - $99.99	$6.50
$100 - $198	$8.00
Over $199	$10.00

COMET ROAD FREIGHT ANYWHERE IN AUSTRALIA ONLY $13.50

bankcard · MasterCard · AMERICAN EXPRESS · VISA · Cards Welcome

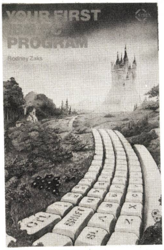
MAIL ORDER VIA YOUR PHONE

Books & Literature



BASIC for the IBM PC

YOUR FIRST IBM PC PROGRAM: by Rodney Zaks. Published 1984 by Sybex, Berkeley. Soft covers, 177 x 277mm, 190 pages, with appendices and glossary, profusely illustrated with cartoons and examples. ISBN 0-89588-171-3. Retail price $21.95.



This book is aimed at all those people who own an IBM PC or PC-compatible who are presently using DOS or CP/M-based programs and have yet to try programming in Basic. Zaks uses the chatty approach of his previous books to lead these people very gently into the land of Basic and supports his easy text with a wealth of cartoons.

In my opinion though, the cartoons are a little over-done and tend to distract the reader from the tasks set by the Author, which are by no means onerous. There are a lot of program examples which are very well explained.

The text is centred upon IBM Basic which is supplied on the DOS disk. IBM's extended version, Basic A, gets a mention but is not otherwise covered in the text.

However, while supposedly written just for the IBM PC Basic on disc, virtually all of the text could apply just as well to the ROM-resident Basic in the IBM PC or PC-compatibles and to virtually any personal computer which has Basic. The exceptions are those programs which employ "floating point" arithmetic.

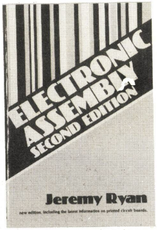
Having said that, the text can be highly recommended to any person who wants to gain a working knowledge of Basic. (L.D.S.)

Workshop Practice

ELECTRONIC ASSEMBLY: by Jeremy Ryan, published by Reston Publishing Co, Inc, 1985. Soft covers, 153 x 228mm, 185 pages, illustrated with diagrams and photographs. ISBN 0-8359-1581-6. Recommended retail price $38.95.

Offering an introduction to workshop practices, this book might prove most suitable for high school students, first year trade course students or anyone new to electronics. The opening chapter is titled "Safety" and deals with electric shock, tools and general shop rules. Other chapters include component colour coding, soldering practice and PC board manufacture.

At the end of each chapter there is a quiz or test. Generally, the questions are not too taxing and most students would have no trouble "passing". Where study is needed, explanations are presented clearly and simply. This format might prove useful for an instructor required to train completely inexperienced students — a text to be read before the first foray into the lab. Our copy was supplied by Prentice-Hall of Australia Pty Ltd. (C.R.D.).


ELECTRONIC ASSEMBLY
SECOND EDITION
Jeremy Ryan
new edition, including the latest information on printed circuit boards.

Computer Interfacing

COMPUTER INTERFACING TECHNIQUES IN SCIENCE: by Paul E. Field and John A. Davies. Published 1985 by Scott, Foresman and Company, Glenview, Illinois. Soft cover, 193mm x 235mm, 218 pages, illustrated with diagrams. ISBN 0-673-18112-X. Retail price $US12.95.

Despite its American publisher, this book has an Australian connection. John A. Davies is a lecturer at the Queensland Institute of Technology in Brisbane. Paul E. Field is Professor of Physical Chemistry at Virginia Polytechnic Institute and State University in Blacksburg, Virginia.

The book has been written for a range of readers, from science teachers to computer hobbyists, and covers the fundamental concepts of computer interfacing. The authors believe that all you need is a basic understanding of electricity and the BASIC programming language and you're in business — measuring and controlling experiments and instrumentation with microcomputers.

What better way to learn about digital and analog electronics and the Z80 micro than by practising what is preached? To this end, each chapter includes a section of practical experiments to reinforce the theory. It soon becomes apparent that the general philosophy of the text is learning through doing.

By following it and the experiments, readers will learn how to build input and output ports, convert analog signals to digital input, and generate the control signals used for advanced interfacing. Some 30 experiments are included in the book.

A further plus is the illustrative material which is extremely comprehensive and the text is concise and easy to read. Our review copy came from the publishers: Scott, Foresman and Company, Professional Publishing Group, 1900 East Lake Avenue, Glenview, Illinois 60025, USA. (L.U.)

SUBSCRIBE TO ELECTRONICS AUSTRALIA NOW. . . AND YOU COULD

WIN

A SENSATIONAL 4 WHEEL DRIVE DAIHATSU 'ROCKY'!

(Worth over $21,500)

EVERY NEW SUBSCRIBER WILL ALSO GET A FANTASTIC **35mm CAMERA** (Valued at $25) **FREE!!**

A.C.T. PERMIT NO. TT85680 ISSUED UNDER LOTTERIES ORDINANCE 1964. VIC. RAFFLES AND BINGO PERMITS BOARD PERMIT NO. 85/1237 ISSUED ON 16/12/85. N.S.W. PERMIT NO. TC85/2867 ISSUED UNDER THE LOTTERY AND ART UNION ACT.

WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR C

WHEN GEOFF DOES A KIT HE DOES IT PROPERLY

Geoff's policy is to do a few kits and do them well. Rather than bundle up bits and pieces for everything under the sun, Geoff takes a lot of trouble to get all the RIGHT parts for just a few projects. As a result you can be assured that there are no dubious substitutions and that all parts are prime spec.

Also the projects are checked out before the kit is even considered. Both of this month's projects had mistakes in the original articles - in both cases the PCB layout was incorrect - and Geoff was the one who spotted the errors.

AEM4600 DUAL SPEED MODEM

Geoff can't put this kit together fast enough. The queue started to form the moment the magazine came out.

Features both 300/300 baud full duplex and 1200/75 baud half duplex operation so it's ideal for Viatel. All functions are selected with quality C&K toggle switches with four LEDs to indicate correct functioning. Interfacing is standard RS232 using a minimum of signal lines for "universal" interfacing.

Geoff's kit comes complete with punched front panel (looks like a bought one!) and is just **$159.00**

ETI 169 LOW DISTORTION OSCILLATOR

If you're checking out Hi Fi systems then an audio oscillator is a must. The trouble is that the average el-cheapo probably has a higher level of distortion than a $10 transistor radio. So with this kit there can be NO compromises. The distortion just has to be better than 0.001%. Covers the frequency range to 100kHz. Geoff has checked the whole thing through with Ian Thomas (including pointing out the track error on the pcb).

Kit again includes a posh front panel and the top quality AB pot (available separately at **$9.00**).

Complete kit **$179.00**

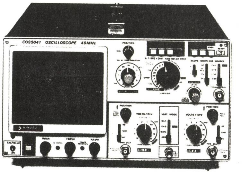
WE DAREN'T QUOTE PRICES – OUR STOCK DOESN'T LAST LONG ENOUGH TO KEEP UP WITH THE DOLLAR!!

COS5041

40MHz DELAYED SWEEP

- *40MHz, 5mV/div (1mV x5 Mag)*
- *20nS max sweep speed (x10 Mag)*
- *Built-in delay line*
- *Variable Hold-Off and Trigger Lock*
- *12kV PDA bright clear display*
- *Includes 2 FREE Probes*

KIKUSUI



TRUE RMS

EDM1346

ONLY $225.00 *ex tax (\$258.75 inc tax)*

• 4½ digits • 8 functions Vdc, Vac, Adc, Aac, Ohms, Audible Continuity, Diode test, Data Hold • 0.05% basic accuracy

DC Voltage	
Range	• 200mV, 2V, 20V, 200V, 1000V
Resolution	• 10uV, 100uV, 1mV, 10mV, 100mV
Accuracy	• 200mV – 1000V ± (0.05%rdg + 3dgt)
AC Voltage: (True RMS, AC coupled 10% to 100% of range)	
Range	• 200mV, 2V, 20V, 200V, 750V
Resolution	• 10uV, 100uV, 1mV, 10mV, 100mV
Accuracy	• 200mV – 200V @45Hz-1KHz ± (0.5%rdg + 20dgt) @1KHz – 2KHz ± (1.2%rdg + 30dgt) @2KHz – 5KHz ± (5.0%rdg + 40dgt) (200V @2KHz – 5KHz not specified) 750V @45Hz – 1KHz ± (1.0%rdg + 20dgt)
DC Current	
Range	• 2mA, 20mA, 200mA, 2A, 10A
Resolution	• 100nA, 1uA, 10uA, 100uA, 1mA
Accuracy	• 2mA – 200mA ± (0.3%rdg + 3dgt) 2A-10A ± (0.75%rdg + 3dgt)
AC Current: (True RMS, AC coupled 10% to 100% of range)	
Range	• 2mA, 20mA, 200mA, 2A, 10A
Resolution	• 100nA, 1uA, 10uA, 100uA, 1mA
Accuracy	• 2mA @45Hz – 400Hz ± (2.5%rdg + 20dgt) 20mA – 200mA @45Hz-400Hz ± (0.75%rdg + 20dgt) @400Hz – 1KHz ± (0.75%rdg + 30dgt) 2A-10A @45Hz – 500Hz ± (1.2%rdg + 20dgt)
Resistance	
Range	• 200Ω, 2KΩ, 20KΩ, 200KΩ, 2MΩ, 20MΩ
Resolution	• 0.01Ω, 0.1Ω, 1Ω, 10Ω, 100Ω; 1KΩ
Accuracy	• 200Ω ± (0.2%rdg + 5dgt + 0.04Ω) 2KΩ – 200KΩ ± (0.1%rdg + 3dgt) 2MΩ ± (0.15%rdg + 3dgt) 20MΩ ± (0.5%rdg + 3dgt)

LORLIN QUALITY WAFER SWITCHES

If you're finding it hard to get the wafer switch you want for a particular project give Geoff a call. He can build to your order from the high quality Lorlin RA range - and up to 6 banks. The following configurations are available:

Poles	1	2	3	3	4	2
Positions	12	6	3	5	2	4	9

Contacts have a 5A rating with only 10 milliohm resistance. Diameter is 25.4mm.

8.30 to 5 Monday to Friday. 8.30 to 12 Sat
Mail Orders add \$3.00 to cover postal charges.
Next day delivery in Sydney add \$5.00.
All prices INCLUDE sales tax.
Tax exemption certificates accepted if line value exceeds \$10.00.

GEOFF WOOD ELECTRONICS

GEOFF WOOD ELECTRONICS PTY LTD
Incorporated in N.S.W.
656A Darling St, Rozelle 2039
(One door from National Street)
Tel: **810 6845**

bankcard
\$10.00 minimum

specialising in electronic components for the professional and hobbyist.

Troubleshooting faulty projects

after switching off, feel each transistor. Use only a light touch with the fingertip, and quickly contact each one in turn, before they have a chance to cool down.

With mains-powered equipment, switch off first, then pull the plug out of the power point (do both). **Reason:** The switch may be in the off position, but the contacts are still live. If a check shows the transistors to be cold, and all the surrounding components are correctly placed, you may have inserted the transitor leads into the wrong holes.

If you do not have test equipment and are unable to identify the base, collector or emitter leads, build yourself a tester from a kit. You can then check out which lead is which and also whether the transistor is working or not.

Remember, should you choose to take the kit to a local repairer, the cost may well exceed the price of a tester. Besides this, you will not have learned how to do it yourself, and you will have no tester for the next project.

The rule is to resort to outside help only if you are sure that you will never build another kit.

Integrated circuits

Generally, these do not show any outward signs of damage unless grossly mistreated. CMOS ICs can be ruined simply by touching the pins. These devices are sensitive to static electricity stored in the body. This may be generated by the movement of clothing or by crossing a carpet (particularly with synthetic materials).

When picking up these devices, grasp the plastic case by the ends and keep your fingers off the pins! Should the leads be hard to insert into the board, you may find that the legs are spread wider than the row of holes. You will have to bend the legs to fit.

To do this, carefully wrap the IC in aluminium foil. This shorts all the pins together, so that there is no potential difference between them. The leads may now be bent by pushing them against a flat surface (eg, a bench top). Do the same for both sides of the device so that it fits easily into the board.

One of the main reasons for an IC not working is incorrect orientation. If power has been applied, it will almost certainly have been damaged. All that can be done in this case is to take it out and replace it with a new one. Note that any components connected to it should be checked as a precaution against damaging replacement ICs as well. When installing ICs, make sure that the notch or spot denoting the pin 1 end matches the direction on the diagram or the silk screened overlay.

Switching on

Don't! With battery powered equipment, make sure the battery connections are not reversed. Measure the battery voltage first, before switching on.

After switching on, again measure the battery voltage. If there is only a small drop in voltage, well and good. A sudden fall in voltage means that the circuit is drawing a lot of current, and a fault is still present (or you have a high resistance in the switch). Poor switch contacts may not show up on the meter but, at the same time, the switch will not pass sufficient current to supply the circuit. Under these circumstances, the circuit will not function and the switch may be the only fault with it.

If the switch and battery are cleared, employ the following procedures:

Switch off. Consult the circuit diagram for voltage readings. These should be marked on the diagram at various test points near transistors and at other strategic points as selected by the designer to aid in fault finding.

Don't try to take measurements at the test points on the board by consulting the diagram and then hunting around for them. Whilst you are engaged in this, time is passing — time in which your project could cook itself out of existence. Locate the test points on the board with the power off. When you are certain of the location of each point, mark it with a felt pen and number it.

Take a scribble pad and mark down each voltage reading from the diagram against the corresponding number. Now switch on and compare your readings with the list you have made. This will help you check quickly. Any differences will enable you to pin down the fault to a particular section. After that, it is up to you.

With mains-powered projects, make sure all connections at mains potential are covered with insulation tape. You will be placing your hands near them — play it safe!

Before switching on, check the connections to the mains transformer — you may have it in back to front! If this is OK, check the secondary AC voltage first, then check the DC rail voltage. Both should be close to that marked on the diagram.

Colour blindness

If you have a tendency to install resistors in the wrong positions, you may be colour blind.

To check this, buy a pack of mixed resistors (200-300) and sort them according to value.

Now check the values on your multimeter. If more than 10 are incorrect, get your colour vision tested. If you are colour blind, this would present problems in industry or service work.

Plugpacks can cause problems

Be careful when powering battery-operated equipment from plugpack transformers. These invariably suffer from poor regulation and their output voltage may be much higher than that specified.

For example, on a 6V plugpack, the open circuit voltage measured nearly 10V. When using this to power a radio-cassette recorder, the output voltage fell to around 7.5V under load. This rose to somewhere near the open-circuit level whenever the volume was turned down or when tuning between stations.

This generally has no ill effect on equipment with silicon transistors. However, some cassette players, radios and intercoms, particularly those of Asian manufacturers, still use germanium transistors which are prone to failure under these conditions.

One solution is to fit 1A diodes in series with the supply to drop the voltage to a safe level. These can usually be fitted inside the case of the relevant item.

Another solution is to use a plugpack regulator. A suitable circuit was described in *Electronics Australia* in January 1983 (File No. 2/PS/53).

Torch Cells

What can go wrong with these? Well, they can go flat but that's not always the problem. They may also seem to be flat.

Try cleaning the cap and base with steel wool. The surface may have oxidised or oil from your fingers may have caused a high resistance contact to develop. Cleaning the ends of the cell may not put new life into it, but it will enable you to get full use from it.

In the case of partial destruction, they may still function in the circuit. However, they will then operate at a greatly reduced capacitance.

Semiconductors

Check the diodes for correct orientation. Start with the small signal diodes. These are the first to suffer should polarity be reversed.

Most of the small signal diodes are in glass cases. They may appear as normal, but could be either shorted or open circuit. Again, as with resistors, unsolder one end and lift it clear of the board.

On checking with a multimeter on the high range, one direction should read low in resistance while the other should read high. If you find a high reading in both directions or a low reading in both directions, the diode has failed.

Zener diodes, if found to be faulty, must be replaced by the exact type. Do not substitute a one watt type in place of a 400mW type — there will be a difference in impedance between the two types. The designer has probably specified the smaller size for a particular reason, and has therefore allowed a sufficient safety margin. If it is at all suspect, replace it.

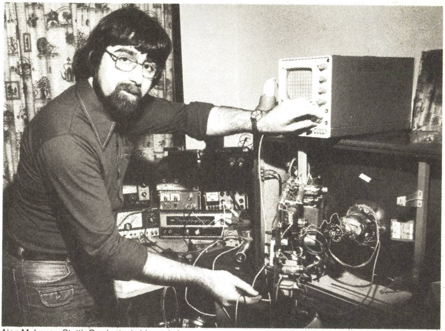
Transistors

Visible damage to transistors may range all the way from a cracked case to smoke rising from the plastic body due to overheating. In extreme cases, the chip may pass so much current that it vaporizes. This causes a rapid rise in internal pressure, far more than the plastic case is capable of handling. Under these conditions, the case either develops a large bulge or explodes, leaving only three legs standing in the board.

Should any of the above occur, check all components connected to the particular transistor, otherwise the replacement could end up in the same condition.

Where no visible damage is evident,

INTERESTED IN ELECTRONICS?
THEN WHY NOT TURN YOUR HOBBY INTO A CAREER?



Alan Mulraney, Stott's Graduate, in his workshop.

In this fast-changing electronic world people with interest and training are going to be in demand. Turn your interest into a lucrative career in any one of the following fields:

Computers • Industrial Controls • Medicine
Radio Communications • Domestic Radio & Television

Electronics plays an important role in these and many other fields. With a Stott's Home Study Course, training is easy, and will prepare you for a career in the manufacture, installation, commissioning, sales or servicing of electronic equipment.

You'll have experienced, professional instructors who will guide you through an integrated theory/practical program. They'll give you individual attention and advice, and prompt replies to all test assignments and queries. And best of all, you'll study at your own pace, in your own home.

Send the coupon today. It may be the smartest move of your life.

Stotts
CORRESPONDENCE COLLEGE
The name to trust in correspondence education.

Melbourne, 140 Flinders Street, 3000. Tel: 63 6212
Sydney, 383 George Street, 2000. Tel: 29 2445
Brisbane, 65 Mary Street, 4000. Tel: 221 3972
Adelaide, 226 Pulteney Street, 5000. Tel: 223 3700
W. Perth, 25 Richardson Street, 6005. Tel: 322 5481
Hobart, 150 Collins Street, 7000. Tel: 34 2399
New Zealand, Box No.30-990, Lower Hutt. Tel: 676 592

Please send me free, and without obligation, full details of the following courses:

________________ (PLEASE PRINT)

____

MR. MRS. MISS ________________ AGE ____

ADDRESS ________________

________________ POSTCODE ________

Stott's undertake that no sales counsellor will visit you.

The Stott's range of courses in Electronics is:

Intro to Electronics
Digital Electronics for Technicians/Servicemen
Microprocessors
Radio Receivers
Radio/TV Servicing
Colour Television

ALA/ST5303/EA 2 86

A practical approach to

Electronics

PART

6

Troubleshooting faulty projects

Not all projects work first time. In this chapter, we take a look at some simple troubleshooting procedures. We will assume that the circuit has been built exactly as described and that no parts have been substituted.

By KINGSLEY HOWE

You have completed your kit, checked it over and switched it on. It works OK? Good — enjoy the results.

But what if it doesn't work properly or not at all? Don't worry. Switch off immediately and check your work as follows.

Resistors

Begin by checking the resistors. They may be in the wrong positions. Don't use your multimeter yet — carry out a visual inspection first.

Find a place where the light is good to check the resistor values. With resistors coming from so many different manufacturers, body colours and colour brands vary a great deal. A few brands are coated with varnish for protection and this can make colours appear darker than normal.

It can also be hard to distinguish between colours. Some reds and oranges appear very similar, as do many greens and blues. It may be necessary to use a magnifying glass to distinguish the colour bands on some very small metal film resistors.

A safe method is to check the resistors with a multimeter before they are installed. The resistors cannot be measured after installation as there are now other components joined to them and this will usually give false readings.

If you must measure resistors in-circuit, unsolder one end and lift the lead clear of the board. Assuming all the resistors are in their correct places, move on to capacitors.

Capacitors

Start with the electrolytics. Are they the right way around? Are all the sides marked with arrows (negative) inserted correctly?

Have a good look. Occasionally a manufacturer marks the positive side with an arrow. Examine the 'tail' of the arrow, look for a circle in the tail. This circle contains the polarity mark (+ or −).

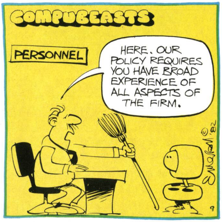
Different brands may have the polarity marked in the arrow head or inside a black stripe. Larger capacitors may be marked with a black spot on the terminal lug for negative identification. Some may be printed with the words "case is negative".

With tantalum capacitors, look for a spot marked on the body. This is the front of the capacitor and the positive lead is on the right hand side. The markings on these are industry standard for colour coded tantalums.

However, there are plain blue bodied tantalum capacitors with the value printed on the front, and a line of plus signs running down the body from top to bottom on the right hand side.

No problems here, but you may find the kit supplier has substituted blue-bodied solid aluminium resin dipped capacitors, which look exactly the same as tantalums. Some of these may have the left lead marked positive, when viewed from the front. Philips' types are marked in the conventional manner (+ leg is at the right hand side), but some Asian and American made capacitors are marked differently.

If you have installed any polarised capacitors incorrectly, and applied power to the circuit, they may be damaged. It is best to replace them. If they are destroyed internally, this is not always detectable, and you can burn out other components as well if you reuse them!


COMPUBEASTS
PERSONNEL
HERE. OUR POLICY REQUIRES YOU HAVE BROAD EXPERIENCE OF ALL ASPECTS OF THE FIRM.
© '82
9

INTRODUCING

THE

MicroProfessor I/88

from

Multitech
INDUSTRIAL
CORP.

• 16 bit, 8088 Single Board Low Cost
Computer / Trainer / Development System

LEARN THE 8088

The Micro-Professor I/88 has everything you need to understand the fundamentals of the 8088 microprocessor.

Your computer skills will increase dramatically as the Micro-Professor translates important concepts into practical experience. And with a wealth of accessories including a printer, EPROM programming board and Forth Language option, there's no limit to the applications you can develop.

A LEARNING SYSTEM AND MORE

More than a learning system, it can be expanded to a stand alone development system with on-board assemblers.

Transferring data and programs between the MPF-1/88 and other systems — like your PC — is easy.

The MPF-I/88 system board is housed in a grey plastic case and is fitted with a full size 59-key QWERTY keyboard. Display is provided by a two line by twenty character LCD display. I/O is provided by a 64 way card edge connector which carries the system bus.
The MPF-I/88 system monitor supports 19 single letter commands.

DOCUMENTATION

With three well documented and easy to follow handbooks and an optional 'TUTORIAL' handbook, there is little chance that students might find themselves out in the cold.

HARDWARE EXPANSION

IFM-I/88: Interface Module for IBM-PC and conventional MPF-I expansion cards.
SPS-I/88: Switching Power Supply for the Interface Module.
EPB-I/88' EPROM Programmer with Communications Drivers.
PRT-I/88: Dot Matrix Printer

SOFTWARE EXPANSION

VIP-I/88: Video Interface Program to drive IBM-PC display cards
FORTH-I/88
TWO PASS ASSEMBLER & EDITOR

EMONA COMPUTERS PTY. LTD.

1st Floor 720 George St
Sydney 2000 Phone: (02) 212 4599

If you're into computers you could have a job for life.

If you're interested in the finer points of digital electronics and computers, the computer industry needs you.

Enrol now into Control Data Institute's Computer Engineering course and you could be working in the ever-expanding computer industry in as little as 8 months.

Control Data Institute's flexible study programmes will allow you to study full-time or part-time in subjects such as **Electronics, Microprocessors, Mini Computers, Data Communication, Terminals, Disk Drives, Line Printers** and **Machine Language Programming.** Or if you choose, you can study individual subjects.

You can even get exemptions if you have some experience in the electronics field. And at the end of your course of study, you qualify with a Diploma in Computer Engineering.

Control Data is accepting enrolments now for their Computer Engineering courses in Sydney and Melbourne. The demand for Control Data Engineering Graduates has never been higher.

For further information call Control Data Institute now. You can attend special monthly free engineering information seminars or phone Wendy Mason in Sydney on (02) 438 1300 or Sherrill Maconachie in Melbourne on (03) 268 9666 for a personal appointment.

CONTROL DATA
INSTITUTE
YOUR CAREER BEGINS HERE
An education service of Control Data Australia Pty. Limited.
Burrows Doble Lawrence CDA 1640

Imagine . . . you'll receive 12 feature-packed issues of Electronics Australia, Australia's top selling monthly electronics magazine (delivered to your home FREE). Plus – you'll also get a **FREE 35mm Camera** (worth $25)!!

AND THAT'S NOT ALL . . .

YOU COULD ALSO WIN A DAIHATSU 'ROCKY' 4WD, LONG-WHEEL-BASE DIESEL WAGON.

ALL FOR JUST $30! Now that's real WINNING VALUE!!

YES! YOU COULD WIN 'ROCKY'

With this powerful 4 Wheel Drive vehicle, you'll always be where the action is! **Just look at the incredible FEATURES:**

- **Power Steering**
- **3-Way Suspension**
- **AM/FM Stereo Radio/Cas.**
- **Tilt Steering**
- **215 SR Wide Tyres & Wheels**
- **Carpeting Throughout**
- **Full Fabric Seats**

PLUS ALL THESE SPECIAL EXTRAS:

- **Bull Bar**
- **Tow Bar**
- **Side Steps**
- **Weather Shield**
- **Exterior Striping**
- **Sunroof**
- **Headlamp Covers**

PLUS A UNIQUE PAINT JOB – ONLY ONE OF ITS KIND!!!

(The vehicle is the same one shown on this page)

FREE!

YOUR FREE GIFT!!

This versatile, go-anywhere camera takes superb 35mm colour slides or prints (also black & white).

FEATURES: ● *Automatic focussing* ● *Automatic digital frame counter* ● *Simple to load* ● *Easy to use exposure settings* ● *Sports grip* ● *Soft push button* ● *Flash facility* ● *Tripod socket.*

INCLUDES: ● *Durable, good looking body* ● *Fine 50mm lens* ● *Lens cover* ● *Handy shoulder strap* ● *Zip-up protective carrying case* ● AND A FULL 12 MONTH GUARANTEE

NOW YOU'LL ALWAYS HAVE A RELIABLE CAMERA ON HAND WHEN YOU NEED ONE!

An excellent second camera for you . . . or an ideal gift for the kids.

NOW, ALL THAT ADDS UP TO AN OFFER YOU JUST CAN'T REFUSE!!
BUT HURRY! This is a limited offer . . . YOU MUST ACT NOW!!!

HOW TO WIN, AND CLAIM YOUR FREE GIFT:

Simply complete your special PRIVILEGE OFFER SUBSCRIPTION CARD between pages 34 and 35, and mail it FREE POST (no postage stamp required) to us. We'll automatically send you your FREE camera with your first issue . . . and your name will be entered into the draw to **WIN the DAIHATSU 'ROCKY'.**

YOUR NO-RISK GUARANTEE

If, for any reason you are not completely delighted with the magazine . . . simply let us know, and we'll gladly refund the unused portion of your subscription.

DON'T DELAY . . . MAIL YOUR SUBSCRIPTION CARD TODAY TO RECEIVE YOUR FREE GIFT!

If the Subscription Card has been removed, please write to:

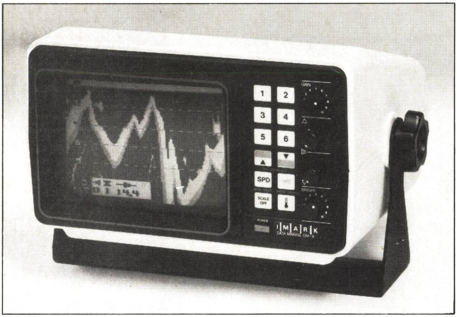
ELECTRONICS AUSTRALIA.
FREE POST No. 4 (*No postage stamp is required*)
The Federal Publishing Co. Pty Ltd
P.O. Box 227, Waterloo, NSW 2017

CLAIM YOUR FREE GIFT TODAY!

(Offer valid until 30 April, 1986. All Federal Publishing New Subscribers during Feb., March and April are eligible to win)

New Products...

Product reviews, releases & services



Video depth sounder

Imark Pty Ltd have released the Imark DM-60 Video Sounder, for use by sport fishermen or pleasure boaters.

The DM-60 has a maximum range of 146 metres and utilises a 15 cm (diagonal) CRT screen instead of the usual chart paper to display the sea bottom, reefs and fish beneath the vessel.

There are six basic depth ranges: 0-10, 0-20, 0-40, 0-80 and 0-160 metres. A "Freeze Frame" facility as well as a normal dynamic display is included and the control panel is backlit for night use.

The sounder has membrane switches to select the sweep speed, to impose an electronic graticule screen over the CRT display, for selection of deep and shallow alarms and there are rotary controls for Gain, Alarm Loudness, Screen Brightness and Power On/Off.

Further details can be obtained from the importers, Imark Pty Ltd, 167 Roden Street, West Melbourne, Victoria 3003. Telephone: (03) 329-5433.

Loudspeakers with extended bass response

Designed and manufactured in Australia by Audiosound Laboratories, the new 8035 loudspeakers offer sub-woofer bass performance by using a newly developed 200mm bass driver unit with a high temperature voice coil wound on an aluminium former. Their power handling capacity is adequate for use with amplifiers up to 50 watts RMS.

The enclosure is designed to Thiele principles and the low frequency alignment is −3dB around 38Hz and only −5dB around 30Hz. Dimensions of the 8035s are 1040mm (H) x 310 (W) x 390 (D).

For further information contact Audiosound Laboratories, 148 Pitt Road, North Curl Curl 2099. Telephone: (02) 938 2068.

Inbuilt VCR alarm system

DCB Computer Marketing has developed an alarm system for VCRs and other electrical home appliances which operates via the 240V AC electric supply.

The system consists of an FM transmitter and receiver which operates via the AC mains, as with wireless intercoms. The receiver is built into the VCR and a continuous coded signal is fed from the transmitter via the building's electrical wiring. In the event of the VCR being unplugged, the receiver emits an ear-piercing audio alarm and also prevents the VCR from working from any mains outlet in another building.

For proper operation both the transmitter and receiver/s should be operating on the same electrical phase.

For further information contact DCB Computer Marketing, 81 Kingsclere Avenue, Keysborough, Victoria, 3173. Telephone: (03) 798 2323.

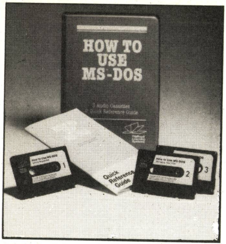
Cassette tutorials for program learning

This new learning system is ideal for first-time users wanting to quickly learn programs from a wide range of available microcomputer products.

With the emphasis on doing, rather than reading, the user is guided step by step through the programs with the aid of instructions on audio cassettes.

The total package for a particular program comprises the disks for the specified computer, a fully indexed lesson summary and the audio cassettes. Any standard cassette player may be used, with no computer hook-up required.

Packages available include Lotus

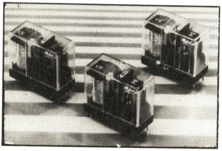


1-2-3, MS-DOS, Wordstar, Mailmerge, Multiplan and an Introduction to BASIC.

For example, the MS-DOS tutorial teaches the user to master the keyboard and essential DOS commands and the procedures for disk storage and file management with floppy disks and, as an option, a fixed or hard disk drive. Use of a printer and special features of DOS, such as tree-structured directories and batch processing, are also covered.

For further information contact Barrington Corporation, PO Box 683, Norwood 5067. Telephone: (03) 332 0122.

New relays have high voltage isolation

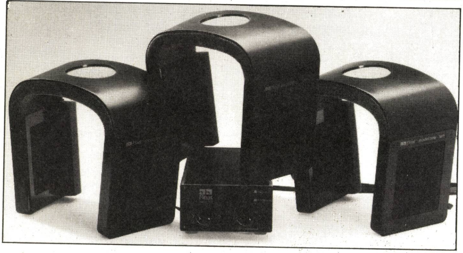


An addition to the Fujitsu FBR600 series of miniature PCB-mounting types of relays has been released by IRH Components.

The model features 16-amp contact rating (240V AC or 30V DC resistive) in SPST format. Single coil magnetic latch types are also available in SPST and DPDT format.

The FBR600 series has 5kV RMS or 10kV impulse contact to coil isolation and has SECV approval. The available coil voltage range is from five to 60V with 5, 6, 12, 24 and 48V being the preferred types.

For further information, contact IRH Components, 32 Parramatta Road, Lidcombe 2141. Telephone: (02) 648 5455.



J. J. Float headphones now available

Audio Dynamics have just released the range of J. J. Float headphones in Australia. Three models are available, including the Model I and Model II, which are both two-way dynamic types priced at about $169 and $199 respectively. The top model J. J. Float is electrostatic and comes with its own power supply unit which will drive two sets of phones. The power supply and one headset is priced at $749.

They look a little heavy and unwieldy but are quite light to wear. The manufacturers claim that the design has been produced as a way of preventing distortion of the pinna (the outer ear) which is both uncomfortable and causes auditory passage distortion and unnatural brightness of sound.

More information is available from the Australian distributor Audio Dynamics, 155 Camberwell Road, East Hawthorn 3122.

KALEX

UV MATERIALS

3M Scotchcal Photosensitive

		Pack Price	
8007	Reversal film	$35.40	$47.60
8005	Black/Aluminium	$64.95	$74.75
8011	Red/White	$58.50	$67.30
8013	Black/Yellow	$58.50	$67.30
8015	Black/White	$58.50	$67.30
8016	Blue/White	$58.50	$67.30
8018	Green/White	$58.50	$67.30

AUSTRALIA'S LARGEST STOCKISTS

UV PROCESSING EQUIPMENT

KALEX LIGHT BOX

- Autoreset Timer
- 2 Level Exposure
- Timing Light
- Instant Light Up
- Safety Micro Switch
- Exposure to 22in × 11in

$499.00 + ST

KALEX "PORTU-VEE"

- UV Light Box
- Fully Portable
- Exposure to 10in × 6in

$175.00 + ST

PCB PROCESSING

KALEX ETCH TANK

- Two Compartment
- Heater
- Recirculation
  (by Magnetic Pump)
- Two Level Rack
- Lid

$595.00 + ST

RISTON 3400 PCB MATERIAL

SIZE INCHES	SINGLE SIDED	DOUBLE SIDED
36 × 24	$67.50	$82.50
24 × 18	$33.75	$41.25
18 × 12	$17.00	$22.00
12 × 12	$11.50	$14.00
12 × 6	$6.00	$7.50

All prices plus sales tax if applicable.

KALEX
40 Wallis Ave.,
East Ivanhoe 3079
(03) 497 3422
497 3034
Telex AA 37678
9.30 a.m. – 4.30 p.m.
Monday–Friday

bankcard welcome here
MasterCard
VISA

ELECTRONIC COMPONENTS & ACCESSORIES
• SPECIALIST SCHOOL SUPPLIERS

COMMODORE 64

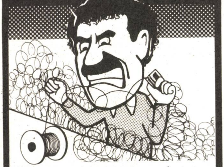
Videotex
Software complete
with Modem
(access to Viatel)
Complete package
$299

DTX Videotex
Terminal DR Monitor
$499

VIEWTEL
700 Mount Alexander Rd.,
Moonee Ponds, Vic. 3039
☎ (03) 370 5454

Mail orders welcome
P & P $10.00

DON'T GET
WOUND UP OVER
YOUR WINDING
PROBLEMS

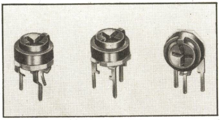


We custom design and manufacture
in volume, transformers and coils
for any application.

SELECTRONIC
Selectronic
Components
PTY. LTD.
25 Holloway Drive, Bayswater,
Vic., 3153. Telephone: (03) 762 4822.

New Products...

Miniature cermet trimmer



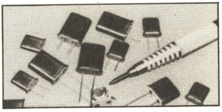
IRH Components have introduced the new Murata miniature RVG070H horizontal adjust cermet trimmer.

While only 6mm in diameter, it provides a relatively high power dissipation of 300 milliwatts. Available resistance range is 100Ω to 1mΩ, with a tolerance of ±20%.

The device is made of cermet resistive film printed on an alumina substrate. Because of its dust-proof and multi-contact wiper structure, the RVG070H series offers good contact stability. Residual resistance is five ohms or 1% of nominal value.

For further information, contact IRH Components, 32 Parramatta Road, Lidcombe 2141. Telephone: (02) 648 5455.

Motorola MFX crystal filters



The MFX series is an extensive line of monolithic crystal filters supplied by Motorola. They offer 4-pole narrow bandwidth performance, from 45MHz to 175MHz, in a single TO-8 package.

Motorola claim that the frequency selectivity provided directly at these frequencies would be ideal for those communication's applications which require small size and simplified circuit schematics.

The MFX series is available in a straight 4-pole pole filter configuration, two separated 2-pole filter configuration, or a custom circuitry module tested and adjusted by Motorola.

For further information contact the Sydney sales office on (02) 438-1955.

CAD program for PCB design

The Protel-PCB is an Australian-developed low cost, multi-layer, printed circuit board design program. Protel-PCB software offers facilities for the creation of camera-ready PCB artwork.

Specifications include the option of up to 6 track layers, plus two additional layers for component overlay and text. Provision has been made for an adjustable grid size from 0.01 to 0.1 inch.

The plotter output provides either a 1:1 multicolour fast check plot, or a 2:1 final artwork plot.

For further information contact HST Industries Pty Ltd, 445 Macquarie Street, Hobart, Tasmania 7000. Telephone: (002) 34 8499.

FROM PHILIPS
THE CREATORS OF
COMPACT DISC

COMPACT
disc
DIGITAL AUDIO

PHILIPS
PHILIPS
PHILIPS
FIVE BAND STEREO GRAPHIC EQUALIZER
COMPACT disc DIGITAL AUDIO
MICROPROCESSOR LOGIC CONTROLLED COMPACT DISC PLAYER
CD 555 COMPACT DISC SOUND MACHINE
AUTOREVERSE
PROGRAMMABLE MEMORY

Imagination gets carried away.

You know how exciting the pure, perfect sound of Compact Disc can be.

Well now Philips, creators of Compact Disc technology, have created the pure, perfect and powerful sound of the CD 555.

It's the big portable Compact Disc deck with a more powerful sound to carry around. Pure and perfect, wherever you find yourself.

Of course this sound machine also features an auto reverse cassette deck, four band tuner, 2 x 25 watt amplifier and two way speakers.

But when you have this much imagination it's hard not to get carried away.

**Philips Compact Disc.
Imagination leads the way.**

PHILIPS We want you to have the best.

PHILIPS

PMP 1564

Electronics Australia Binder &

WIRELESS WEEKLY. Our own time machine! It may look like a book, but don't let it's appearance fool you. There are no whirling dials and control levers; but once you open the cover, it'll take you on an incredible journey backwards in time. You'll find yourself back in the 1920's, when Australia's first few radio stations were just getting established and a typical radio set cost ten weeks' wages. We've chosen a collection of highlights from the 1927 issues of 'Wireless Weekly': You'll find some front covers, a few editorials, the best new items, a collection of typical do-it-yourself radio set designs, and some selected pages from the programme listing. Plus a sprinkling of the original advertisements, of course. These are particularly fascinating because they show prices and put everything into proper context. Send today for ***The Best of Australia's Wireless Weekly in 1927*** . . . A fascinating and nostalgic trip into our radio past. **N0049A** **$3.95**

THE BEST OF AUSTRALIA'S
Wireless Weekly
IN 1927
SEE THE RADIO SETS THAT GRANDPA BOUGHT (OR BUILT) TO TUNE IN THE NEWFANGLED WIRELESS PROGRAMS!
EASY TO BUILD
ELECTRONICS PROJECTS for your CAR
EASY-TO-UNDERSTAND GUIDE TO
HOME COMPUTERS
AN ELECTRONICS AUSTRALIA PUBLICATION
ELECTRONIC TEST GEAR TO BUILD!
for the hobbyist and enthusiast

ELECTRONIC PROJECTS FOR YOUR CAR. How can you extend the performance of your car without it costing an arm and a leg? With these selected projects from *Electronics Australia* you can add all of the gadgets you've dreamed of: Cruise Control, Courtesy Light Delay, Deluxe Burglar Alarm, Headlight Reminder, Audible Reversing Alarm, Transistor-assisted Ignition with Optoelectronic Trigger, Driveway Sentry, Speed Sentry, Tacho/Dwell Meter, Breakerless Ignition, Audible Turn Signal and more easy-to-build projects to add value, interest and safety to your pride and joy! PLUS Feedback from those who have built the projects themselves and Bright Ideas for you to develop yourself: Automatic Antennae Retraction, 6V Car Adaptor, Fuse-Failure Indicator and more . . . **C0064A** **$3.95**

ELECTRONIC TEST GEAR TO BUILD. Why buy it? These valuable projects from *Electronics Australia* will add a new dimension to your workshop! Detailed, step-by-step instructions guide you through the construction of the most useful of electronic workshop test gear: 500 MHz 7-digit Frequency Meter, Wheatstone Bridge and Resistance Box, AC Millivoltmeter, DC Voltmeter, LCR Bridge, Modulated Signal Injector, Audio Prescaler. PLUS Feedback from those who have built the projects themselves and Bright Ideas for you to develop yourself: Linear Frequency Controller, Dummy Loads, General Purpose Counter Timer and more . . . **Never built a project before?** What better way to get started than by building the test instruments needed to begin a workshop? **Build it yourself to save and learn at the same time! F0067A** **$3.95**

EASY-TO-UNDERSTAND GUIDE TO HOME COMPUTERS. Confused by all these computer terms? This clearly written book from the editors of *Consumer Guide* tells exactly what computers are, how they work and why they are so amazingly useful, all in plain English. Here is all of the information needed to understand and use computers, and even to start programming. A special buying section compares the most popular home computers. This book is your ticket to the computer age! Spiral bound, 96pp. **H0066G** **$8.50**

THE USER'S GUIDE TO COMMODORE 64 & VIC 20. The editors of *Consumer Guide* have compiled a thorough introduction to the Commodore 64 and Vic 20 computers, software and peripherals. With colour illustrations and a clearly written text, this reference will guide the newcomer through all phases of learning how to use the computer: From setting the system up, expanding the system with peripherals, to buying new software. Specific exercises are included for each of the keys. Spiral bound, 80pp. **H0065G** **$8.50**

MAGAZINE BINDERS **B901EA**

Ready to use binders with easy, clip-in fastener, covered in soft, decorator brown vinyl. Holds 12 issues of electronics Australia.

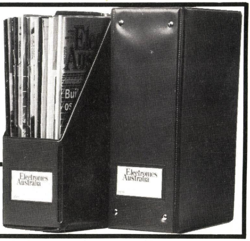
$7.50

Postage and packing additional.

MAGAZINE HOLDERS **H951EA**

Big, easy to assemble holders, covered in soft, decorator brown vinyl. Holds 12 issues (at least) of Electronics Australia.

$7.00

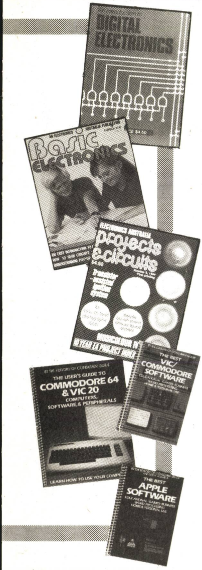


SAVE WITH SIX

6 Holders — only **$37.50**
6 Binders — only **$39.95**

Book Sales

FREEPOST 4 *(No stamp needed)*
The Federal Publishing Company,
PO Box 227, Waterloo, NSW 2017
Tel: (02) 663-9999. Tlx: AA74488



DIGITAL ELECTRONICS. Electronic equipment plays an important role in almost every field of human endeavour and every day, more and more electronic equipment is 'going digital'. Even professional engineers and technicians find it hard to keep pace. In order to understand new developments, you need a good grounding in basic digital concepts and *Introduction to Digital Electronics* can give you that grounding. Tens of thousands of engineers, technicians, students and hobbyists have used this book to find out what the digital revolution is all about. This new fourth edition has been updated and expanded to make it of even greater value. No previous knowledge of digital electronics is necessary — The book includes an excellent coverage of basic concepts. **A0079A** **$4.50**

BASIC ELECTRONICS. This popular text has now been re-issued. *Basic Electronics* is almost certainly the mosty widely used reference manual on electronics fundamentals in Australia. Written as a basic text for the electronics enthusiast, it is also being used by radio clubs, secondary schools and colleges, and in WIA youth radio clubs. It begins with the electron, introduces and explains components and circuit concepts and progresses through radio, audio techniques, servicing test instruments, television, etc. If you've always wanted to know more about electronics, but have been scared off by the mysteries involved, let *Basic Electronics* explain them to you. Easily understood diagrams and text make this the perfect introduction to the growing and exciting world of electronics. We've even included five electronic projects for the beginner. **A0074A** **$4.50**

PROJECTS & CIRCUITS. If you like building electronic projects in your spare time, you can't afford to miss out on this exciting book of popular projects from *Electronics Australia.* Just look what's inside! **Audio and Video Projects:** Video Amplifier for Computers and VCRs, Video Enhancer, Vocal Canceller, Stereo Simulator for Tuners and VCRs, Guitar Booster for Stereo Amplifiers. **Automotive Projects:** Transistor-assisted Ingition System, Breath Tester, Low Fuel Indicator, Speed Sentry, Audible Turn Indicator. **Mains Power Control Projects:** Musicolor, Photographic Timer, Driveway Sentry, Touch-lamp Dimmer. **Power Supplies and Test Equipment:** Battery Saver for Personal Portables, Dual Tracking ±22V Power Supply, 3 1/2-Digit LCD Capacitance Meter, In-Circuit Transistor Tester. **Plus EA's 10-year project index.** **C0069A** **$4.50**

THE BEST VIC/COMMODORE SOFTWARE. Trying to find the most suitable software for personal computers can be frustrating. The editors of *Consumer Guide* have compiled comprehensive reviews of VIC 20 and Commodore 64 programs based on ratings by user groups; further evaluation is given by the editors and Commodore software experts Jim and Ellen Strasma. Each review describes the program's purpose and features, detailing both the good points and bad. Each program has been rated for ease of use, clarity of written and on-screen instructions, and overall performance. The program's price, publisher, format and hardware requirements are also included. The reviews are presented in sets by topic: Word Processing, Business, Home, Education, Networking, Strategy Games, Arcade Games and Programming Aids. Spiral bound, 192pp. **K0052G** **$12.00**

THE BEST APPLE SOFTWARE. The editors of *Consumer Guide* have compiled comprehensive reviews of Apple II, II Plus and IIe programs based on ratings by user groups; further evaluation is given by the editors and Apple software expert Roe Adams. Each program has been rated for ease of use, clarity of written and on-screen instructions, and overall performance. The program's price, publisher, format and hardware requirements are also included. The reviews are presented in sets by topic: Word Processing, Business, Home, Education, Networking, Strategy Games, Arcade Games and Programming Aids. Spiral bound, 160pp. **K0060G** **$12.00**

EA-1-86 BOOK TITLE/PRODUCT NAME	CODE NUMBER	QTY	PRICE TOTAL

Cheque*/Money Order ☐ **Please make payable to the Federal Publishing Company Pty. Ltd.*

Put your cheque or money order in an envelope.
Mail to Freepost 4, PO Box 227, Waterloo, NSW 2017 *No postage stamp required in Australia.*

Mastercard ☐ American Express ☐ Bankcard ☐ ☑ *Tick*

☐☐☐☐ ☐☐☐ ☐☐☐☐ ☐☐☐☐☐☐☐ *Credit Card No.*

(Unsigned orders cannot be accepted)

Card Expiry Date.................... Signature..

Allow up to 6 weeks for delivery.

Total order value $........................

Add postage and handling $........................

TOTAL $........................

NAME: ....

ADDRESS: ....

....

.... POSTCODE: ....

POSTAGE AND HANDLING CHARGES

ORDER VALUE	ADD
1 Book	$1.50
Up to $9.99	$2.25
$10 to $19.99	$4.25
$20 to $39.99	$5.25
$40 to $99.99	$6.25
$100 and over	$7.25

For airmail to New Zealand, Papua New Guinea, Oceania and Southeast Asia, add $6.00 to these charges.

SERIES 5000

INDIVIDUAL COMPONENTS TO MAKE UP A SUPERB HIFI SYSTEM!

By directly importing and a more technically
organisation, ROD
we also
assembled and tested.

WHILE OUR CURRENCY IS DEVALUING PRICES WILL RISE, SO BE QUICK!

POWER AMPLIFIER

WHY YOU SHOULD BUY A "ROD IRVING ELECTRONICS" SERIES 5000 POWER AMPLIFIER....

- 1% Metal Film resistors are used where possible.
- Alumimium case as per the original article.
- All components are top quality.
- Over 1000 of these kits now sold.
- Super Finish front panel supplied at no extra cost.

Please note that the "Superb Quality" Heatsink for the Power Amplifier was designed and developed by ROD IRVING ELECTRONICS and is being supplied to other kit suppliers.

SPECIFICATIONS: 150 W RMS into 4 ohms
POWER AMPLIFIER: 100W RMS into 8 ohms (+ −55V Supply)
FREQUENCY RESPONSE: 8Hz to 20Hz +0=.0.4 dB 2.8Hz to 65KHz, +0=3 dB. NOTE: These figures are determined solely by passive filters.
INPUT SENSITIVITY: 1 V RMS for 100W ouput.
HUM: 100 dB below full output (flat).
NOISE: 116 dB below full output (flat, 20KHz bandwidth).
2nd HARMONIC DISTORTION: ‹0.001% at 1 KHz (0.0007% on Prototypes) at 100W ouput using a + =56V SUPPLY rated at 4A continues ‹0.0003% for all frequencies less than 10KHz and all powers below clipping.
TOTAL HARMONIC DISTORTION: Determined by 2nd Harmonic Distortion (see above).
INTERMODULATION DISTORTION: 0.003% at 100W. (50Hz and 7KHz mixed 4:1).
STABILITY: Unconditional.

Cat. K44771 **Will be $359, limited stock available at $339**
Assembled and tested $549
packing and post $10

PREAMPLIFIER

THE ADVANTAGES OF BUYING A "ROD IRVING ELECTRONICS" SERIES 5000 PREAMPLIFIER KIT ARE....

- 1% Metal Film Resistors are supplied.
- 14 Metres of Low Capacitance Shielded Cable are supplied (a bit extra in case of mistakes).
- English "Lorlin" switches ae supplied (no substitutes here.)
- Specially imported black anodised aluminium knobs.

Available Assembled and Tested. (We believe that dollar for dollar there is not a commercial unit available that sounds as good!)

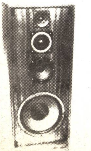
SPECIFICATIONS:
FREQUENCY RESPONSE: High-level input: 15Hz =130KHz, +0.=1dB Low-Level input-conforms to RIAA equalisation + =0.2dB
DISTORTION: 1KHz ‹0.003% on all inputs (limit of resolution on measuring equipment due to noise limitation).
S/N NOISE: High-Level input, master full, with respect to 300mV input signal at full output (1.2V)›92dB flat ›100dB A-weighted, MM input, master full, with respect to full output (1.2V) at 5 mV input 50ohms source resistance connected: ›86dB flat/92dB A-weighted MC input, master full, with respect to full output (1.2V) and 200uV input signal: ›71dB flat ›75dB A-weighted.

Cat. K44791 **Will be $319, limited stock availble at $299**
Assembled and tested $599
packing and postage $10

THIRD OCTAVE GRAPHIC EQUALIZER

SPECIFICATIONS:
BANDS: 28 Bands from 31.5Hz to 16KHz.
NOISE: ‹0.008mV, sliders at 0, gain at 0(=103dB0).
20KHz BANDWIDTH DISTORTION: 0.007% at 300mV signal, sliders at 0, gain at 0, maximum 0.01%, sliders at minimum.
FREQUENCY RESPONSE: 12Hz=105KHz, +0,=1dB, all controls flat.
BOOST AND CUT: 14dB

Cat. K44590 1 unit: **will be $219, limited stock availble at $199**
2 unit: **will be $429, limited stock available at $194**
packing and postage $10



SERIES 4000 SPEAKERS

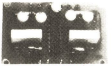
8 Speakers On	**$295**
8 Speakers with Crossovers	**$499**
Speaker Boxes (assembled with grill and speaker cutout)	**$325**
Crossover Kits	**$199**
Complete kit of parts (speakers, crossovers, screws, innerband boxes.)	**$799**
Assembled, tested and ready to hook up to your system	**$895**

Errors and Ommissions Excepted

40 W INVERTER

This 12 240 V inverter can be used to power up mains appliances rated up to 40 W, or to vary the speed of a turntable. As a bonus, it will also work backwards as a trickle charger to top up the battery when the power is on. (EA May'82) 82IV5

Cat. K82050 **$57.50**



GENERAL PURPOSE PREAMPLIFIER

A general purpose stereo preamplifier using a single LM382 IC which can be tailored for use with magnetic pickups, tape recorders or microphones by changing a few components. (ETI445) (ETI July '76)

Cat. K44490 **$8.95**

ELECTRONIC MOUSETRAP

This clever electronic mousetrap disposes of mice instantly and mercifully, without fail, and resets itself automatically. They'll never get away with the cheese again!
(ETI Aug.'84) ETI 1524
Cat. K55240 **$27.50**

VOICE OPPERATED RELAY

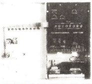
EA's great Voice Operated Relay can be used to control a tape recorder, as a VOX circuit for a transmitter or to control a slide projector. (EA Apr '82) 82VX4

Cat. K82043 **$17.95**

STEREO ENHANCER

The best thing about stereo is that it sounds good! The greatest stereo hi-fi system loses its magnificence if the effect is so narrow you can't hear it. This project lets you cheat on being cheated and creates an 'enhanced stereo effect' with a small unit which attaches to your amp. (ETI 1405, ETI, MAR '85)

Cat. K54050 **$79.50**



MULTI SECTOR ALARM STATION

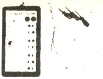
The Christmas season always brings with it an increase in home burglaries, so nows the time for installing security equipment. Relieve the boredom, save money, and at the same time protect your home from intruders with this up-to-the-minute burgular alarm system. Its easy to build, costs less than equivalent commercial units, and features eight seperate inputs, individual sector control, battery back up and self-test facility.

Specifications:

- Eight sectors with LED status indication.
- Two delayed entry sectors.
- Variable exit, entry and alarm time settings: entry delay variable between 10 and 75 seconds; exit delay variable between 5 and 45 seconds; alarm time variable between 1 and 15 minutes.
- Resistive loop sensing: suits both normally open and normally closed alarm sensors.
- Battery back-up with in-built charger circuit.
- Built-in siren driver.

Complete kit including deluxe prepunched metal work and electronics for only...

Cat. K85900 **$129**



TRANSISTOR TESTER

1000's SOLD

Have you ever desoldered a suspect transistor, only to find that it checks OK? Trouble-shooting exercises are often hindered by this type of false alarm, but many of them could be avoided with an "in-circuit" component tester, such as the EA Handy Tester. (EA Sept.'83) 83TT8

Cat. K83080 **$17.95**

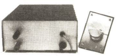
300 BAUD DIRECT CONNECT MODEM

Modem? What do I want with a modem? Think of these advantages:

- Can't afford a floppy disc? Use your telephone to access one for the cost of a call.
- Bored with your old programs? Download hundreds of free programs.
- Want to get in touch with fellow computer enthusiasts? Use 'electronic mail'.
- Ever used a CP/M system? CP-DOS? UNIX? Well a modem will make a your computer a remote terminal on some of the most exciting systems around.

Save on ready built modems.

Cat. K97050 **$119**
(Short form without phone)



LOW-COST BIPOLAR MODEL TRAIN CONTROLLER

Here is a simple model train control for those enthusiasts who desire something better than the usual rheostat control. It provides much improved low speed performance and is fully overload protected, yet contains relatively few componenets. Best of all, you don't need to be an electronic genius to construct it. (80TC12) (EA Dec '80)

Cat. K80120 **$39.95**

GENERAL PURPOSE AMPLIFIER CLASS B

One of the handiest 'tools' for the electronics experimenter is a genuine purpose audio amp: This module will work from a wide range of supply voltages, has good sensitivity, is robust and reliable - easy to build too! (ETI 453) (ETI April '80)

Cat. K44530 **$24.50**

150W MOSFET POWER AMPLIFIER

Here's a high power, general purpose 150W Mosfet Power Amp Module! Suitable for guitar and P.A. applications and employing rugged, reliable Mosfets in the output stage. (ETI 499) (ETI March '82)

Cat. K44990 **$79**
(Heatsink not included)
plus transformer **$49.50**

300W "BRUTE" AMPLIFIER

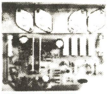
The "Brute" develops 300W into 4 ohms, 200W into 8 ohms!

For many aduio applications there's no substitue for sheer power - low efficiency speakers, outdoor sound systems, or maybe you like the full flavour of the dynamic range afforded by a high power amp. Whatever your requirement - this 'super power' module should fill the bill. (ETI 466) (ETI Feb '80)

Cat. K44660 **$89.95**
(Heatsink not included)

ZENER TESTER

A simple low cost add-on for your multimeter. This checks zeners and reads out the zener voltage directly on your multimeter. It can also check LEDs and ordinary diodes.
(ETI May'83) ETI 164
Cat. K41640 **$9.95**



MOSFET POWER AMPLIFIER

Employing Hitachi Mosfets, this power amplifier features a 'no compromise' design, and is rated to deliver 150 W RMS maximum and features extremely low harmonic, transient and intermodulation distortion.
ETI 477 (ETI Jan.'81)
(Single module only)
Cat. K44770 **$79.50**
Plus power supply (No trans) **$49**
Plus transformer PF4361/1 **$49.50**

PARALLEL PRINTER SWITCH

Tired of plug swapping when ever you want to change from one printer to another? This low-cost project should suit you down to the ground. It lets you have two Centronics-type printers connected up permanently, so that you can select one or the other at the flick of a switch.
(ETI 666, Feb. '85)

Cat. K46660 **$79.95**

50 W AMPLIFIER MODULE (ETI 480)

Cat. K44880 **$27.50**
(Heatsink optional extra)

100 W AMPLIFIER MODULE (ETI 480)

Cat. K44801 **$29.95**
(Heatsink optional extra)

EPROM PROGRAMMER

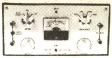
If you have ever wanted to rewrite or extend the operating system of your microcomputer or if your're interested in dedicated microprocessor applications then this EPROM Programmer is just the thing. It is an inexpensive unit that uses readily available IC's, interfaces directly to the expansion bus on the back of all the popular 8080/Z80 microcopmputers and programs 2708's, 2716's, 2758's and 2732's. (EA July '80) 80PP71

Cat. **$79.50**
(Horwood case supplied)

PHONE MINDER

Dubbed the Phone Minder, this handy gadget functions as both a bell extender and paging unit, or it can perform either function separately. (EA Feb.'84) 84TP2

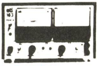
Cat. K84021 **$27.50**



AUDIO TEST UNIT

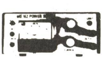
Just about everyone these days who has a stereo system also has a good cassette deck, but not many people are able to get the best performance from it. Our Audio Test Unit allows you to set your cassette recorder's bias for optimum frequency response for a given tape or alternatively, it allows you to find out which tape is best for your recorder. (81AO10) (EA Oct '81)

Cat. K81101 **$59.95**



LAB SUPPLY

Fully variable 0-40V current limited 0-5A supply with both voltage and current metering (two ranges: 0-0.5A/0-5A). This employs a conventional series-pass regulator, not a switchmode type with its attendant problems, but dissipation is reduced by unique relay switching system switching between laps on the transformer secondary.
(ETI May'83) ETI 163
Cat. K41630 **$182.50**



30 V/1 A FULLY PROTECTED POWER SUPPLY

The last power supply we did was the phenomenally popular ETI-131. This low cost supply features full protection, output variation from 0V to 30V and selectable current limit. Both volatage and current metering is provided. (ETI Dec.'83) ETI 162

Cat. K41620 **$52.50**

ELECTRONIC WATT METER

This unit will measure the power consumption of any mains appliance with a rating up to 3 kilowatts. It makes use of a special op amp called an 'output transconductance amp' or OTA. for short. (EA Sept.'83) 83WM8

Cat. K83082 **$89.95**

rie

ROD IRVING ELECTRONICS
425 High Street, NORTHCOTE. 3070
VICTORIA, AUSTRALIA
Phone (03) 489 8866
48 A'Beckett St. MELBOURNE. 3000
VICTORIA, AUSTRALIA
Ph. (03) 663 6151
Mail Order and correspondance:
P.O. Box 620. CLAYTON 3168
TELEX: AA 151938

MAIL ORDER HOTLINE
(03) 543 7877
(2 lines)

POSTAGE RATES

$1-$9.99	$2.00
$10-$24.99	$3.00
$25-$49.99	$4.00
$50-$99.99	$5.00
$100-199	$7.50
$200-$499	$10.00
$500 plus	$12.50

This is for basic postage only. Comet Road freight, bulky and fragile items will be charged at different rates.

Certified Post for orders over $100 included "free"!
Registered Post for orders over $200 included "free"!

All sales tax exempt orders and wholesale inquiries to RITRONICS WHOLESALE, 56 Renver Rd., Clayton. Phone (03) 543 2166

MasterCard VISA

Errors and Omissions Excepted.

New echo sounder from Imark

This compact echo sounder features two ranges: 0-20 metres and 0-60 fathoms (360ft). Designated the SMR SX-6000A, it features two built-in alarms (deep and shallow) which can be set at any depth. This "Bottom Trak" feature can be used as an anchor watch when anchored at night.

The SX-6000A also features a rugged ABS housing designed to withstand the marine environment. This housing incorporates a built-in sun shade and a glare proof dial to ensure good visibility. Dimensions are 190 x 140 x 100mm (W x H x D). The unit is supplied complete with a power cable, transducer and operator's manual.

For further details contact Imark Pty Ltd, 167 Roden St, Melbourne 3003. Telephone (03) 329-5433.

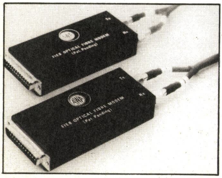
New data-powered optical fibre modem

A data-powered optical fibre modem which requires no separate power connection has been designed and manufactured in Australia by Amalgamated Wireless (Australasia) Limited (AWA).

The FIE8 Optical Fibre RS232 modem is totally powered by receive and transmit data signals. The user can plug the modem into the back of an RS232 outlet or computer peripheral and connect the fibre cable for the system to be fully operational.

Transmitting asynchronous data at a rate of 19,200 bits per second over distances of up to 2km, the FIE8 optical fibres are non-conductive and thus eliminate electromagnetic and radio frequency interference.

For further information contact AWA on (02) 887-7111.



Brushless motor commutator IC

National Semiconductor Corporation recently introduced the LM621 which controls the power switching devices used to drive a brushless DC motor.

This commutator IC provides an adjustable dead-time circuit to eliminate "punch-through" current spiking in the power switching circuitry. Operation is from a 5-40V supply. Logic inputs are TTL compatible.

The LM621 is compatible with three and four-phase, delta or Y-wound, motors. Applications for the IC include robotics, brushless DC fans and speed servos.

Pulsar Electronics has 16-Bit CPU card

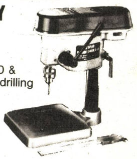
Pulsar Electronics has designed a CPU card for the multi-user environment which is capable of running TurboDos, CP/M 86 and MS-DOS operating systems.

The Pulsar 6016 CPU card was designed using Mil-spec multiwire circuitry and has the 80186 processor running at 8MHz. It is available with either 256K or one Megabyte of DRAM on board.

For further information, contact Pulsar Electronics, Lot 67 Catalina Drive, Tullamarine, Victoria 3043. Telephone: (03) 429 2977.

toyo

P.C.B. DRILLING and ELECTRONIC WORKSHOP MACHINERY



DRILLING MACHINES
Capacity: 0–6.5mm

MODEL MD1H: 2 speeds 8000 & 12000 rpm for printed circuit board drilling

MODEL MD1: 6 speeds 800–3100 rpm for general purpose precision work

MINIATURE LATHE ML1
100mm swing, 250mm between centres

For details contact

MELBOURNE MACHINERY CO. (SALES) PTY. LTD.
51 Queensbridge Street, South Melbourne (03) 61 2911.

EP 232

The EP232 turns your PC or CPM computer into a versatile EPROM PROGRAMMER able to program all common EPROMS up to 27256.

- Software provided gives a comprehensive set of commands
- Simple interface via RS232 port
- TTL PROM programming modules available
- Locally made EP232 costs a fraction of imported programmers

CALL FOR DETAILS
Diamond Systems (03) 714 8269
P.O. Box 105 Hurstbridge 3099

Master Electronics-Microprocessors -Now! The Practical Way!

- Electronics—Microprocessors—Computer Technology is the career and hobby of the future. We can train you at home in a simple, practical and interesting way.

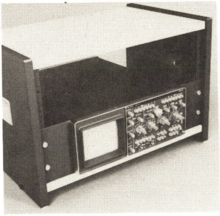
POST COUPON NOW
The Australian School of Electronics Pty Ltd
(inc in Victoria)
116–120 Hawthorn Rd.,
Nth Caulfield, 3161

New Job? New Career? New Hobby?
SEND THIS COUPON NOW

Please send your brochure without any obligation to:
Name ....
Address ....
.... Postcode .... EA

New Products...

Oscilloscopes for rack mounting



Standard 19-in rack-mounting versions of three general purpose Philips oscilloscopes have been made available. The PM 3215R single and PM 3217R dual-time base 50MHz models and the PM 3267R 100MHz unit can be integrated into standard racks for a wide range of applications.

The PM 3215R and PM 3217R models feature 50MHz bandwidths with 2mV sensitivities for their dual vertical inputs. The PM 3267R includes a third trigger-view channel, alternative display of main and delayed timebases and comprehensive trigger facilities.

For further information contact Philips Scientific and Industrial, 25-27 Paul Street, North Ryde 2133. Telephone: (02) 888-8222.

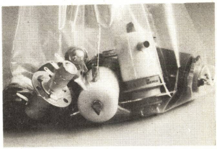
Multitasking BASIC tool

The Pro-Log Corporation has released a multitasking, Z80-based software module for the STD Bus. Multi-Basic allows an engineer to create and execute, in real-time, a BASIC program that can control up to 16 tasks simultaneously. The product would work well with automated industrial control applications that involve multiple operations.

At its core is a multitasking BASIC interpreter located in ROM on Pro-Log's 7806 CPU board. This interpreter handles standard BASIC commands and several enhance commands, which make sure the timing and I/O port values are correct before executing a task.

For further information contact Pro-Log Pty Ltd, PO Box 1, Canterbury, Victoria, 3126. Telephone: (03) 836 3533.

Vacuum relays upgraded



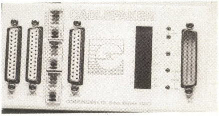
Using a silicon coating, the dielectric strength of Siemens series 300 vacuum relays has been increased from 4.5 to 8.0kV and series 400 from 12 to 14kV.

Vacuum relays are the ideal choice for use in antenna matching applications. When changing channels, the output power of a radio transmitter operating between 0 and 40MHz can be fed into the antenna via different matching circuits to obtain optimum results. The RF power is directly switched by the vacuum relay.

These relays have also found widespread application in measuring instruments. The defined vacuum inside these switching elements makes their performance independent of outside pressure conditions.

Contact Siemens Ltd, 544 Church St, Richmond, Victoria 3121. Telephone: (02) 436-8730.

RS232 data line test equipment



Aspect Engineering has a range of three RS-232 and V.24 test devices now available for the Australian market. They are intended to provide practical, low cost test and monitoring of data communication equipment.

The first in the range is the Fakerscope which features a combination of keypad controlled menus and switches to access or capture data, or generate test messages.

AT LAST!

An affordable IBM Software compatible computer for the enthusiast

DSE Multitech

Only

$1395

128K, Single Drive Model as shown, inc MS-DOS. Monitor not included in price.

Yes: at last the enthusiast can afford a true MS-DOS computer. With the world's best and biggest range of software available (and more coming every day!) the real computer hobbyist now has access to virtually limitless applications. No enthusiast should settle for an 'orphan' computer system — go with the strength. You know the MS-DOS system will be around for years: can you say that about most others? Check out the DSE Multitech at your nearest DSE store now!
Cat X-8000

And two other models with even more features:
256K Twin disks, plus EASY word processing package. Cat X-8001 **$1995**

10Meg hard disk (and one floppy), 512K plus AURA integrated software package. Cat X-8002 **$3995**

VZ-300

Over 30,000 sold

THE BEST VALUE IN COLOUR COMPUTERS

Unbelievable! This is DSE's most popular computer ... we've sold thousands to families and small businesses. And now it's yours for under $100. It's so versatile and 'user-friendly', any one can use it. Ideal for experienced programmers and beginners alike. 18K RAM expands up 64K, you can add any number of peripherals and a run of variety of software. This is truly sensational value. Cat X-7300

WAS $149 $99

WOW! CAT COMPUTER FOR UNDER $500!!

SAVE $200

This is it! Your chance to enter the arena of powerful computing at a fraction of the price. CAT is the pick of the litter...thousands have been sold. It's 64K RAM stores and executes large amounts of personal and business data. The 81-keyboard boasts a numeric keypad and 8 function keys. Plus there's hi-res graphics, colour and sound. At this price, the Cat is an incredible bargain you can't afford to miss.
Cat X-7500

WAS $699 $499

IDC FLAT RIBBON CABLES

FEBRUARY ONLY!

All prices per metre

27 way. Cat W-2752. Was $3.95. **NOW $2.95**
26 way. Cat W-2750. Was $3.20. **NOW $2.50**
40 way. Cat W-2754. Was $4.95. **NOW $3.95**
50 way. Cat W-2756. Was $5.75. **NOW $4.75**

B113/MM

DICK SMITH ELECTRONICS COMPUTERSTOP™

For Address details See P98

The second instrument is the Datafaker which allows testing of line faults to identify terminal problems. In addition to breakout and patching facilities, multi-function message generator and error checker operations are provided.

The third instrument is the Cablefaker. This is a Break-Out Box with a liquid crystal display of 16 of the more commonly used line signals. Additional patching for negative and positive signals is provided, and a pulse-catch monitor is included.

For further information, contact Aspect Engineering, Unit 4, 27 Lexton Road, Box Hill 3149. Telephone: (03) 890 5415.

Clip-on ammeter for arc welding

This diagnostic tool from Warsash is for use by engineers and designers involved in setting up or designing welding equipment or electroplating equipment where average current and surge current values are important. The HEME 1000A registers these on a digital display with a hold memory for surge and normal readings.

An analog output socket permits current readings to be recorded on a chart recorder and simultaneously displayed on a CRO.

The HEME 1000A is autoranging from 0-1000 amps, from DC to 1kHz in two ranges 0-200A and 0-1000A. It is supplied with two way analog output lead, leather carry case and 9V alkaline battery.

For further details contact: Warsash Pty Ltd, PO Box 217, Double Bay, NSW 2028. Telephone: (02) 30-6815.

ECLIPSE COMPUTER SYSTEMS

Get the competitive edge with

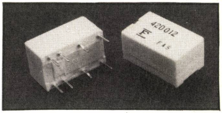
ECS TOMORROW'S TECHNOLOGY TODAY.

Eclipse Computer Systems are proud to present their new range of Australian made and designed computers, offering unparallelled performance in a desktop computer. Advances in design and technology mean that the ECS Computers can complete a task up to 7 times* faster than the older generation of computers:– Features which include
• State of the Art Technology C.P.U. • Runs all popular operating systems
• High density floppy disc drive
• Up to 1Mb. parity checked RAM. on board with no wait states.
The ECS computer was designed for those with applications where performance is critical such as spreadsheets, word processing, accounting, engineering and program development.
SINGLE BOARD COMPUTER KITS ALSO AVAILABLE
*Based on the average of 4 Bench Tests the Eclipse Computers are 2.8 times faster than the new IBM AT and 7.2 times faster than the IBM XT.

IBF/E9

542 Riversdale Road, Camberwell, Victoria 3124 Telephone: (03) 813 3447

DPDT miniature relay with low power coil

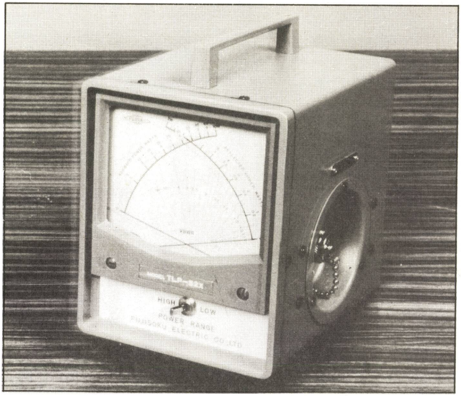


The new Fujitsu FBR40 series of micro-miniature PCB relays has been released by IRH Components. Measuring 16x10x8mm, the FBR40 has dual-inline terminal pitch and features permanent magnetic-assisted armature operation. This results in a coil power dissipation of only 200 milliwatts. A range of coil voltages from three to 24V DC is available.

The double-pole double-throw bifurcated contacts are rated at one amp at 24V DC for resistive loads and are suitable for low level applications. All the terminals are sealed for automatic soldering and two terminals are preformed to lock the relay onto a PCB and prevent movement during soldering.

For further details contact IRH Components, 32 Parramatta Road, Lidcombe 2141. Telephone: (02) 648-5455.

New through-line power meter



Vicom has a new range of RF Thru-Line Powermeters from the Fujisoku Electric Company.

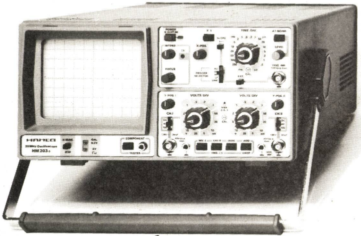
The new series TLP-52X is capable of directly reading forward and reflected power via two separate meter movements in the one common housing. In addition, it is possible to read the standing wave ratio (SWR) at the point where the two meter pointers cross.

Frequency coverage is 1.8 to 1000MHz with two forward power ranges of 10W and 50W. Their accuracy is ±10% of full scale deflection. The unit also provides for "RF sampling" with an isolated output for monitoring with a spectrum analyser.

For further details, contact Vicom Australia Pty Ltd, PO Box 366, South Melbourne 3205.

At Last

A COMPONENT TESTER WITH A BUILT IN SCOPE



Y: 2 Channels DC-20 MHz
Max sensitivity 2mV/cm.

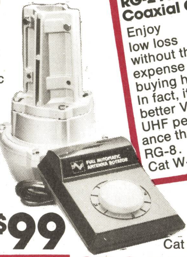
X: 0.2 s/cm–20 ns/cm
including X10 magnification
triggering up to 40 MHz.
Component tester

Price $700 Including Tax

KENELEC (AUST.) PTY. LTD.
(INCORPORATED IN VICTORIA)
48 Henderson Rd.,
Clayton, Vic. 3168
Telephone: (03) 560 1011
N.S.W. (02) 439 5500 QLD. (07) 393 0311 S.A. (08) 42 6877 W.A. (09) 322 4542

DSE — GIVING AMATEURS PRO QUALITY

Mini Antenna Rotator



Pinpoint precise reception spot the easy way. Fully automatic rotator for lightweight antennae ... ideal for most TV, FM and VHF/UHF. Full 360° rotation with mechanical stop.

WAS $125 $99

Cat D-5003

RG-213 Low Loss Coaxial Cable

Enjoy low loss without the expense of buying heliax. In fact, it offers better VHF/UHF performance than RG-8.

Cat W-2099

$2.75 meter

15 - Band Receiver You won't find better!

$329

Cat D-2831

Gives enthusiasts what they want AND more! Tune into local AM/FM plus LW/MW/SW. Five tuning functions allow either direct frequency key-in, auto or manual scanning and manual rotary tuning. There's a 9 station memory. Five LED signal strength meter. LCD digital frequency display doubles as 24 hour clock. Plus many other fine features.

Covers 150kHz to 30mHz in 14 bands + the stereo FM broadcast band.

STORE LOCATIONS

Australia

NSW

Swift & Young Sts.	**Albury**	(060)	21 8399	Treloar's Bldg, Brisbane St	**Tamworth**	(067)	66 1961				
T55 Terrace Level	**Bankstown Sq**	(02)	707 4888	263 Keira St	**Wollongong**	(042)	28 3800	Queen Elizabeth Dr & Bernard St	**Rockhampton**	(079)	27 9644
Shop 1, 65-75 Main St	**Blacktown**	(02)	671 7722	**ACT**				Gold Coast Hwy & Welch St	**Southport**	(075)	32 9863
613 Princess Hwy	**Blakehurst**	(02)	546 7744	96 Gladstone St	**Fyshwick**	(062)	80 4944	Bowen & Ruthven Sts	**Toowoomba**	(076)	38 4300
Oxford & Adelaide Sts	**Bondi Junction**	(02)	387 1444	**VIC**				Ingham Rd & Cowley St West End	**Townsville**	(077)	72 5722
531 Pittwater Rd	**Brookvale**	(02)	93 0441	Creswick Rd & Webster St	**Ballarat**	(053)	31 5433	Cnr Pacific Hwy & Kingston Rd	**Underwood**	(07)	341 0844
Campbelltown Mall Queen St	**Campbelltown**	(046)	27 2199	145 McCrae St	**Bendigo**	(054)	43 0388	**SA**			
Shop 235, Archer St Entrance	**Chatswood Chase**	(02)	411 1955	Shop 46,Box Hill Central,Main St	**Box Hill**	(03)	890 0699	Wright & Market Sts	**Adelaide**	(08)	212 1962
147 Hume Hwy	**Chullora**	(02)	642 8922	Hawthorn Rd & Nepean Hwy	**East Brighton**	(03)	592 2366	Main South & Flagstaff Rds	**Darlington**	(08)	298 8977
164 Pacific Hwy	**Gore Hill**	(02)	439 5311	260 Sydney Rd	**Coburg**	(03)	383 4455	Main North Rd & Darlington St	**Enfield**	(08)	260 6088
315 Mann St	**Gosford**	(043)	25 0235	1150 Mt Alexander Rd	**Essendon**	(03)	379 7444	24 Park Terrace	**Salisbury**	(08)	281 1593
4 Florence St	**Hornsby**	(02)	477 6633	Nepean Hwy & Ross Smith Ave	**Frankston**	(03)	783 9144	**WA**			
Elizabeth Dr & Bathurst St	**Liverpool**	(02)	600 9888	Shop 9 110, High St	**Geelong**	(052)	43 8522	Wharf St & Albany Hwy	**Cannington**	(09)	451 8666
450 High St	**Maitland**	(049)	33 7866	291-293 Elizabeth St	**Melbourne**	(03)	67 9834	66 Adelaide St	**Fremantle**	(09)	335 9733
173 Maitland Rd, Tighes Hill	**Newcastle**	(049)	61 1896	Bridge Rd & The Boulevarde	**Richmond**	(03)	428 1614	William St & Robinson Ave	**North Perth**	(09)	328 6944
Lane Cove & Waterloo Rds	**North Ryde**	(02)	88 3855	Springvale & Dandenong Rds	**Springvale**	(03)	547 0522	Centreway Acde, Hay St	**Perth City**	(09)	321 4357
George & Smith Sts	**Parramatta**	(02)	689 2188	**QLD**				**TAS**			
The Gateway High & Henry Sts	**Penrith**	(047)	32 3400	157-159 Elizabeth St	**Brisbane**	(07)	229 9377	25 Barrack St	**Hobart**	(002)	31 0800
818 George St	**Railway Square**	(02)	211 3777	166 Logan Rd	**Buranda**	(07)	391 6233	**NT**			
125 York St	**Sydney**	(02)	267 9111	Gympie & Hamilton Rds	**Chermside**	(07)	359 6255	17 Stuart Hwy	**Stuart Park**	(089)	81 1977

Dear Customers,

Quite often, the products we advertise are so popular they run out within a few days, or unforseeen circumstances might hold up shipments so that advertised lines are not in the stores by the time the advert appears. And very occasionally, an error might slip through our checks and appear in the advert (after all, we're human too!) Please don't blame the store manager or staff: they cannot solve a dock strick on the other side of the world, nor fix an error that's appeared in print. If you're about to drive across town to pick up an advertised line, why not play it safe and give them a call first ... just in case! Thanks. Dick Smith Electronics.

MAJOR DICK SMITH ELECTRONICS AUTHORISED RESELLERS

NSW: • Ballina: A. Cummings & Co. 91-93 River St 86 2284 • **Ulladulla:** Pauls Electronics, 10 Wason Street, 55 3989 • **Bowral:** Barry Gash Electronics, 370 Bong Bong St 61 2577 • **Broken Hill:** Hobbies & Electronics, 31 Oxide St 88 4098 • **Charlestown:** Newtronics 131 Pacific Hwy 43 9600 • **Coffs Harbour:** Coffs Harbour Electronics, 3 Coffs Plaza, Park Ave. 56 5684 • **Deniliquin:** Deni Electronics, 220 Cressy St, 81 3672 • **Gosford:** Tomorrows Electronics & HiFi, 68 William St, 24 7246 • **Lismore:** Decro 3A/6-18 Carrington St, 21 4137 • **Port Macquarie:** Hall of Electronics, Horton Centre, Horton St, 83 7440 • **Orange:** Fyfe Electronics 173 Summer St, 62 6491 • **Tumut:** Tumut Electronics Wynyard St, 47 1631 • **Tweed Heads:** Stuart Street Electronic Sales, Stuart St, 367 5744 • **Swansea:** Swansea Electronics, 184 High St, 71 1674 • **Wagga:** Phillips Electronics 82 Forsyth St, 21 6558 • **Windsor:** M & E Electronics, Sh 7, Mc Ewans Arcarde, 206 George St, 77 5935 • **Young:** Keith Donges Electronics 186 Boorowa St 82 1279 **VIC: • Hamilton:** John Thompson & Co, 138-148 Gray St, 72 2000 • **Echuca:** Webster Electronics, 220 Packeham St 82 2956 • **Mildura:** McWilliams Electronics 110A Langtree Ave, 23 6410 • **Morwell:** Morwell Electronics, 95 George St, 34 6133 • **Shepparton:** GV Electronics Centre 100 High St, 21 8866 **QLD: • Bundaberg:** Bob Elkin Electronics, 81 Bourbong St, 72 1785 • **Cairns:** Electronic World Shop 27 K-mart Westcourt Plaza, 51 8555 • **Gladstone:** Purely Electronics Shop Cnr. Herbert & Auckland Sts 72 4321 • **Mackay:** Stevens Electronics, 42 Victoria St, 51 1723 • **Maryborough:** Keller Electronics, 218 Adelaide St, 21 4559 • **Mt Isa:** Outback Electronics Shop 71 Barkley Hwy 43 3331 • **Rockhampton:** Purely Electronics, 15 East St, 21 058 **SA: • Mt Gambier:** Hutchessons Communications, 5 Elizabeth St, 25 6404 • **Whyalla:** Eyre Electronics Shop 2 Forsythe St, 45 4764 **WA: • Albany:** Micro Electronics 133 Lockyer Ave 41 3432 **TAS: • Launceston:** Wills Electronics 5A The Quadrant, 34 1399

DSXPRESS ORDER SERVICE

ORDERS OVER $75 FREE DELIVERY

Use your Bankcard, Mastercard or Visacard.
Just Phone **008 226610** (toll free) for, despatch of your orders. Enquiries: By mail or phone (02) 888 2105
Fax (02) 888 3631 Telex AA20036

POST & PACKING CHARGES

Order Value	Charge	Order Value	Charge
$5.00 - $9.99	$2.00	$50.00 - $75.00	$6.50
$10.00 - $24.99	$3.50	$75.00 or more	N.A.
$25.00 - $49.99	$4.50		

Terms available to approved applicants

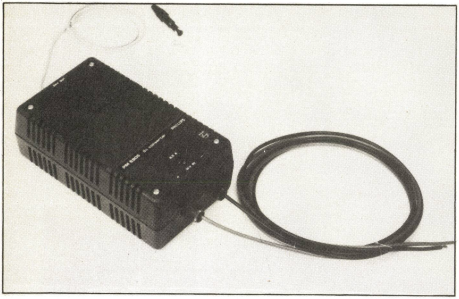
SA Customers: Credit facilities available through AGC
Adelaide: 10 Pulteney St, Adelaide

DICK SMITH ELECTRONICS PTY LTD

P.O. Box 321, North Ryde N.S.W. 2113. Tel: 888 3200

B.114/VP

New Products



DC-to-DC converter for portable scopes

A 12V to 24V DC-to-DC converter has been introduced by Philips Test & Measuring Instruments for use with many of their portable oscilloscopes.

The PM 8905 is designed to allow all PM 3212/15/17 25 and 50MHz series, PM 3254/56 75 MHz, PM 3267 100MHz and PM 3305 digital storage oscilloscopes to be powered from standard 12V car batteries.

The 12V DC input of the converter is fully insulated from the output and protected against short circuits, overload or incorrect polarity of the input voltage by a 6A/250V fuse.

For further information contact Philips Scientific and Industrial, 25-27 Paul Street, North Ryde 2133. Telephone: (02) 888-8222.

Flat cable tester has digital readout

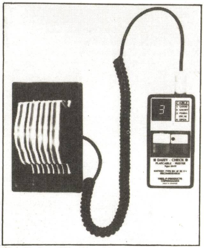
This simple test instrument can be used by anyone involved in the making of factory-tailored flat cables or in the manufacture or repair of equipment incorporating multiconductor cables or harnesses.

The Daisy Check will tell whether the cable is in good order or not and it will indicate any possible defect that may exist.

To operate the instrument the production or suspect cable is plugged into a prepared test fixture, to suit the cable configurations to be tested, the appropriate function selected and then the display is read.

The display shows one of four numerals which indicate a possible cable condition: good-no short-not open circuit; short circuit; intermittent and open.

For further information contact: Warsash Pty Ltd, PO Box 217, Double Bay, NSW 2028. Telephone: (02) 30-6815.



The Daisy Check cable tester features a digital readout and indicates one of four possible cable fault conditions: good, short circuit, intermittent and open.

KNOXTRONICS ELECTRONIC SERVICES

(EASTERN VIDEO CENTRE)
PROP. LEON AARONS, M.T.E.T.I.(Aust.)

8 DARRYL STREET,
SCORESBY, VIC. 3179
PHONE (03) 763 8425

SEE US FOR THE
BEST PRICES
on 27 MHz and UHF CB radios, antennas and accessories.

ELECTROPHONE
27 MHz TX526 AM only, 40ch.
TX565 AM/SSB, 40ch.
UHF TX470T 40ch.
inc. repeater switch.

All 27 MHz radio
include FREE MOBILE
ANTENNA BASE AND LEAD

UNIDEN AX144AM/SSB

- **Full range of mobile antennas and fittings genuine station master ¾W base antenna**
- **Complete after sale service**
- **Sundowner UHF 40ch.**

VIATEL
VIDEO TEX TERMINALS
From only $499

Call in for demonstration
Mail orders welcome
Bankcard–Mastercard–Visa

FULL AFTER SALES SERVICE FACILITIES

1986 compact disc catalog

COMPILED BY DAVID FRITH

Dettingen Te Deum: Choir of Westminster Abbey; Simon Preston, organ; The English Concert; Trevor Pinnock cond.
Archiv (DDD) 410 647-2
Dixit Dominus; Coronation anthem 1; 'Zadok The Priest' soloists; Monteverdi Choir and Orch; John Eliot Gardiner cond.
Erato ECD-88 072
Duets and cantatas: Maria Zadori; Paul Esswood.
Hungarton HCD 12564-65-2 (2 CDs)
Four sonatas for violin and harpsichord: Josef Suk, violin; Zuzana Ruzickova, harpsichord.
Denon C37-7053
Galway conducts Handel: Chamber Orch of Europe; James Galway cond.
RCA RCD15364
Jeptha — complete: Hollweg; Esswood; Thomasche; Mozart Boys' Choir; Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.35 499 (3 CDs)
L'Allegro; Il Penseroso et Il Moderato: Monteverdi Soloists, choir and orch; John Eliot Gardiner cond.
Erato ECD-88 075 (2 CDs)
Messiah (highlights): Margaret Marshall; Catherine Robbin; Anthony Rolfe-Johnson; Robert Hale; Charles Brett; Saul Quirke; Monteverdi choir; English Baroque Orch; John Eliot Gardiner cond.
Philips (DDD) 412 267-2
Messiah—highlights: Soloists, Choir of Christ Church Cathedral, Oxford; Academy of Ancient Music; Christopher Hogwood cond.
L'Oiseau-Lyre 400 086-2
Messiah—complete.
Telarc 80093-2
Messiah—complete: Kweksilber; Bowman; Elliott; Chorus "The Sixteen"; Amsterdam Baroque Orch; Ton Koopman cond.
Erato ECD-88 050 (3 CDs)
Messiah—complete: Nelson; Kirkby; Watkinson; Elliot, Thomas, Choir of Christ Church Cathedral, Oxford; Academy of Ancient Music; Hogwood cond.
L'Oiseau-Lyre 411 858-2 (3 CDs)
Messiah—complete: Lipovsek; Hollweg; Kennedy; Stockholm Chamber Choir; Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.35 617
Messiah—highlights: John Aler; John Cheek; Katherine Ciesinksi; Judith Blegen; Musica Sacra; Richard Westenburg, dir.
RCA RCD14622
Messiah—highlights; Winchester Cathedral Choir; London Handel Orch; Martin Neary cond.
ASV DCA 525
Messiah—highlights: Atlanta Symphony Orch; Robert Shaw cond.
Telarc 80103
Messiah: Margaret Price; Hanna Schwarz; Stuart Burrows; Simon Estes; Bavarian Radio Symphony Orch and chorus; Colin Davis cond.
Philips (DDD) 412 538-2 (3 CDs)
Messiah: Margaret Marshall; Catherine Robbin; Anthony Rolfe-Johnson; Robert Hale; Charles Brett; Saul Quirke; Monteverdi Choir; English Baroque Orch; John Eliot Gardiner cond.
Philips (DDD) 411 041-2 (3 CDs)
Messiah: Kiri Te Kanawa; Gjevang; Lewis; Howell, Chicago Symphony Orchestra and Chorus; Georg Solti cond.
Decca (DH2) 414 396-2
Music for the Royal Fireworks; concerto a due cori Nos 1 & 2: English Baroque Soloists; John Eliot Gardiner.
Philips (DDD) 411 122-2
Music for the Royal Fireworks; suites Nos 1 & 3: Overture in D minor; Water Music, suites Nos 1 & 4: Pittsburgh Symphony Orch; Andre Previn cond.
Philips (DDD) 411 047-2
Music for the Royal fireworks; two concertos for two horns: The English Concert; Trevor Pinnock cond.
Archiv (DDD) 415 129-2
Oboe concertos No 1-2; concerto grosso in C 'Alexander's Feast'; sonata a cinque: David Reichenberg, oboe; Simon Standage, violin; 'The English Concert', Trevor Pinnock cond.
Archiv (DDD) 415 291-2
Ode for St Cecilia's day: Palmer; Johnson; Bach Choir Stockholm; Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.42.349
Ode for St Cecilia's Day: Gomez; Tear; Kings College; English Chamber Orch; Ledger cond.
ASV DCA 512
Organ concertos No 1-6: RTL Symphony Orch; Leopold Hager, organ and cond.
Forlane UCD-16 534
Organ concertos Op 4 and Op 7: Herbert Tachezi, organ; Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.35 282 (3 CDs)
Organ concertos Op 7, No 1-6; Op 4, 1-6 etc: Ton Koopman and F. Ernst, organs; Amsterdam Baroque Orch; Koopman cond.
Erato ECD-88 136 (3 CDs)
Organ concertos, Op 4, No 1-6: Simon Preston, organ; Ursula Holliger (No 6); The English Concert, Trevor Pinnock cond.
Archiv (DDD) 413 465-2 (2 CDs)
Organ concertos, Op 7, No 1-6: Simon Preston, organ; The English Concert; Trevor Pinnock cond.
Archiv (DDD) 413 468-2 (2 CDs)
Recorder concerto and sonatas: Laszio Czidra, recorder.
Hungaraton HCD 12375-2
Recorder sonatas—complete. L'Ecole d'Orphee.
CRD CRD 3412
Six concerti grossi, Op 3: Liszt Ferenc Chamber Orch; Rolla cond.
Hungaraton HCD 12463-2
Six concerti grossi, Op 3: The English Concert; Trevor Pinnock cond.
Archiv (DDD) 413 727-2
Six sonatas for flute and continuo: Auriele Nicolet, flute; Christiane Jaccottet, harpsichord; Mari Fujiwara, cello.
Denon C37-7443
Six sonatas for recorder and continuo; Michala Petri, recorder; Academy of St Martin-in-the-Fields' chamber ensemble; George Malcolm, harpsichord.
Philips (DDD) 412 602-2
Solomon: Carolyn Watkinson; Nancy Argento; Barbara Hendricks; Joan Rodgers; Anthony Rolfe-Johnson; Monteverdi choir, English Baroque Soloists; John Eliot Gardiner cond.
Philips (DDD) 412 612-2 (3 CDs)
Sonatas for flute and continuo: William Bennett, flute; Academy of St Martin-in-the-Fields' chamber ensemble; Nicholas Kraemer, harpsichord.
Philips (DDD) 412 606-2
Sonatas for violin and continuo: Iona Brown; Academy of St Martin-in-the-Fields' chamber ensemble; George Malcolm, harpsichord.
Philips (ADD) 412 603-2 (2 CDs)
Suites for harpsichord: Kenneth Gilbert (digital).
Harmonica Mundi HM 90.0447
The Virtuoso Handel—harpsichord works, incl. Lesson in B flat major; sonata in G minor; sonatina in G minor; etc; Ignor Kipnis, harpsichord.
WEA 79037-2
Three oboe sonatas; three trio sonatas: Academy of St Martin-in-the-Fields' chamber ensemble.
Philips (DDD) 412 598-2
Trio sonatas: Heinz Holliger, Maurice Bourgue, oboes; Klaus Thuneman, bassoon; Yashio Nagashima, contrabass; Christiane Jaccottet, harpsichord.
Denon C37-7026
Trio sonatas Op 2: Academy of St Martin-in-the-Fields' chamber ensemble.
Philips (DDD) 412 595-2 (2 CDs)
Trio sonata Op 5: Academy of St Martin-in-the-Fields' chamber ensemble.
Philips (DDD) 412 599-2 (2 CDs)
Utrecht Te Deum & Jubilate: Soloists; Choir of Christ Church Cathedral, Oxford; Academy of Ancient Music, Simon Preston cond.
L'Oiseau-Lyre 414 413-2
Water Music (3 suites): Scottish Chamber Orch; Alexander Gibson cond.
Chandos CHAN-8382
Water Music—complete: Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.42 368
Water Music—complete: Los Angeles Chamber Orch; Gerard Schwarz cond.
Delos 3010
Water Music suite; Music for the Royal Fireworks: Philip Jones Brass Ensemble.
Decca 411 930-2
Water Music: Riccardo Muti.
EMI 747145
Water Music Festival Strings Lucerne.
Ariola-Eurodisc 610 032-231
Water Music: English Baroque Soloists; John Eliot Gardiner cond.
Erato ECD-88 005
Water Music: The English Concert; Trevor Pinnock cond.
Archiv (DDD) 410 525-2
Water Music; Fireworks Music; etc: Jean-Claude Malgoire, oboe.
CBS CD 39066
Water Music, Suite No 3; organ concerto No 13; works by Albinoni; Boccherini; Pachelbel etc: Martin Haselbrock, organ, Stuttgarter Kammerorchester; Karl Munchinger cond.
L'Oiseau-Lyre 411 973-2
Water Music; The Music for the Royal Fireworks: Academy of Ancient Music; Christopher Hogwood cond.
L'Oiseau-Lyre 411 110-2

HARTY, Hamilton

An Irish Symphony and a Comedy Overture; Ulster Orch; Bryden Thomson cond.
Chandos CHAN-8314
Piano concerto; The Wild Geese; etc; Malcolm Binns, piano; Ulster Orch, Bryden Thomson cond.
Chandos CHAN-8321

HAYDN

Folk songs: Catherine Bott; Melvyn Tan.
Meridian ECD-84 080
London trios No 1-4; divertissments: Jean-Pierre Rampal, flute; Isaac Stern, violin; Mstislav Rostropovich, cello.
CBS CD 37786
Mass in D minor, No 9 'Nelson'; Frieder Bernius, cond.
EMI 860951
Violin concerto in D major; violincello concerto in B flat major; Mari Fujiwara, cello; Netherlands Chamber Orch; Mich Inoue cond.
Denon C37-7023
Arias; cantata; cavatina; Teresa Berganza, mezzo; Scottish Chamber Orch; Raymond Leppard cond.
Erato ECD-88 011
Cantatas: Eva Bartfai-Barta, soprano.
Hungaraton HCD 12432-2
Cello concertos 1 & 4: Julian Lloyd Webber, cello; English Chamber Orch.
Philips (DDD) 412 793-2
Cello concertos: Christopher Coin, Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre (OH) 414 615-1
Harmoniemesse: Slovak Philharmonic, Janos Ferencsik cond.
Hungaraton HCD 12360-2
Horn concerto No 1 and 2; trumpet concerto: Thompson; Wallace; Philharmonia Orch; Warren-Green cond.
Nimbus NIM 5010
Horn concertos No 1 and No 2 plus—concertino (M. Haydn): Dale Clevenger, horn; Franz Liszt Chamber Orch; Budapest.
Teldec 8.42 960
Mass No 7 in tempore belli
Paukenmesse: Judith Blegen; Brigitte Fassbaender; Claes-Hakon Ahnsjo; John Shirley-Quirk; Symphonie Orchester & chorus of the Bayerischen Rundfunk; Leonard Bernstein cond.
Philips (DDD) 412 724-2
Piano concertos: Philippe Entremont, piano; Vienna Chamber Orch.
Teldec 8.43 204
Piano sonatas in C No 48; in D No 51; in

C No 50; Alfred Brendel, piano.
Philips (DDD) 411 045-2
Piano sonatas: Julia Cload, piano.
Meridian ECD-84 083
Six flute concertos: Kuijken Trio.
Accent ACC 47807
Sonata in B minor; sonata in D; sonata in E minor; fantasia in C; adagio in F; Alfred Brendel, piano.
Philips (DDD) 412 228-2
Stabat Mater: Amstrong; Murray; Huttenlocher; Lausanne Vocal Ensemble and Chamber Orch; Corboz cond.
Erato ECD-88 033
String quartet in B flat Op 76 No 4 Sunrise; sring quartet in E flat Op 76 No 6; Orlando Quartet.
Philips (DDD) 410 053-2
String quartet No 77 in C, 'Emperor': Eder Quartet.
Teldec 8.43 110
String quartet No 77 in C, 'Emperor'; plus— quartet No 17 'The Hunt' (Mozart): Amadeus Quartet.
DG (DDD) 410 866-2
String quartets Op 3 'Serenade'; Op 76 'Quintet'; Op 76 'Kaiser'; Philharmonia Quartet Berlin.
Denon C37-7094
String quartets Op 51 'The Seven Last Words from the Cross': Gidon Kremer; Kathrin Rabus; Gerard Causse; Ko Iwasaki.
Philips (DDD) 412 876-2
Symphonies No 49 in F minor 'Passion'; and No 45 in F sharp minor 'Farewell': Liszt Ferenc Chamber Orch.
Hungaraton HCD 12468-2
Symphonies No 100 Military & No 104 London; Concertgebouw Orch Amsterdam; Colin Davis cond.
Philips (ADD) 411 449-2
Symphonies No 100 and No 104; Academy of Ancient Music; Christopher Hogwood cond.
L'Oiseau-Lyre 411 833-2
Symphonies No 94 and No 100; London Philharmonic Orch; Georg Solti cond.
Decca 411 897-2
Symphonies Nos 86 & 87: Academy of St Martin-in-the-Fields; Neville Marriner cond.
Philips (DDD) 412 888-2
Symphonies Nos 91 & 92 'Oxford': Concertgebouw Orch Amsterdam; Colin Davis cond.
Philips (DDD) 410 390-2
Symphonies Nos 93, 94 'Surprise' & 96 'Miracle'; Concertgebouw Orch Amsterdam, Colin Davies cond.
Philips (DDD) 412 871-2
Symphonies: No 6, 7, 8: Academy of St Martin-in-the-Fields; Neville Marriner cond.
Philips (DDD) 411 441-2
Symphony No 101 and No 104: Scottish Chamber Orch; Raymond Leppard cond.
Erato ECD-88 079
Symphony No 103 'Drum Roll'; and No 104 'London': Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DD) 410 517-2
Symphony No 88 and No 92 'Oxford': Vienna Philharmonic Orch; Leonard Bernstein cond.
DG (DDD) 413 777-2
Symphony No 94 'Surprise'; and No 101 'The Clock': Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 410 869-2
Symphony No 96 'Miracle'; and No 100 'Military': Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 410 975-2
The Creation: Edith Mathis; Francisco Araiza; Jose van Dam; Vienna Singverein; Vienna Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 410 718-2 (2 CDs)
The Seasons: Edith Mathis; Siegfried Jerusalem; Dietrich Fischer—Dieskau; chorus of St Martin-in-the-Fields; Academy of St Martin-in-the-Fields; Neville Marriner cond.
Philips (DDD) 411 428-2
Trumpet concerto No 1; plus—horn concerto No 3 (Mozart); oboe concerto (Mozart); bassoon concerto (Mozart); Adolph Herseth; Dale Clevenger; Willard Elliot; Ray Still; Chicago Symphony Orch; Claudio Abbado cond.
DG (DDD) 415 104-2
Vieuxtemps; violin concerto: Cho-Liang Lin, violin, Minnesota Orch.
CBS CD 37796
Violin concerto in C major; plus — violin concerto in B major (M. Haydn); Thomas Zehetmaier, violin; Franz Liszt Chamber orch; Budapest.
Teldec 8.42 917
Violin concerto No 1 in C; violin concerto No 2: Isabelle van Keulen, violin; Netherlands Chamber orch; Antoni Ros-Marba cond.
Philips (DDD) 412 718-2
Violin concerto No 1: Cho-Liang Lin, violin.
CBS CD37796
Zingarese; laendler; nocturnes: Bella Musica Ensemble; Dittrich cond.
Harmonia Mundi HM 90.1057

HAYDN, Michael
Four unpublished symphonies from archives of National Library, Budapest. Franz Liszt Chamber Orch; Budapest.
Teldec 8.43 188

HAYDN/HUMMEL
Classic trumpet concerti: Gerard Schwarz, trumpet and cond; Y Chamber Symphony of New York.
Delos 3001

HEBDEN, John
Six concertos for strings: Cantilena.
Chandos CHAN-8339

HOLST
The Planets suite, Op 32: Orchestre Nationale de France; Lorin Maazel cond.
CBS CD37249
The Planets suite: Scottish National Orch; Alexander Gibson cond.
Chandos CHAN-8302
The Planets suite: RIAS Kammerchor; Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 400 028-2
The Planets suite: Ambrosian Singers; London Symphony Orch; Andre Previn cond.
EMI 747160

HONEGGER
Concerto da Camera for flute, English horn and string orch; plus—duet concerto for clarinet and bassoon, with string orch and harp (R. Strauss): Los Angeles Chamber Orch; Gerard Schwarz cond.
WEA 79018-2
Symphony No 3 'Liturgique'; and No 5 'Di Tre Re'; Bavarian Symphony Orch; Charles Dutoit cond.
Erato ECD-88 045

HUMPERDINCK
Hansel and Gretel—complete opera: Dietrich Fischer-Dieskau; Moffo; Donath; Popp; Ludwig; Toelz Boys Choir; Munich Radio Orch; Eichhorn cond.
Ariola-Eurodisc 6 10 266-232 (2 CDs)
Hansel and Gretel — complete opera: Peter Schreier; Theo Adam; Staatskapelle Dresden; Otmar Suitner cond.
Teldec 8.35 074 (2 CDs)

IPPOLITOV-IVANOV
Symphony No 1, Op 46: Singapore Symphony Orch; Choo Hooey cond.
HK Marco Polo HK 8.220217

IVES
Songs: Robert Alexander, soprano.
Etcetera KTC 1020
Symphony No 4: John Alldis Choir; London Philharmonic Orch; Jose Serebrier cond.
Chandos CHAN-8397

JANACEK
Glagolitic Mass: Czech Phil Orch; Mackerras cond.
Supraphon SUP CD7448
Idyll for string orch; Mladi ('Youth') for wind sextet: Los Angeles Chamber Orch.
WEA 79033-2
Jenufa: Soderstrom; Dvorsky; Ochman; Randova Popp. Vienna Philharmoniker; Sir Charles Mackerras cond.
Decca 414 483-2 (2CDs)
Lachian dances; Idyll: Rotterdam Philharmonic Orch; James Conlon cond.
Erato ECD-88 095
Operatic orchestral suites: Czech Phil Orch, Jilek cond.
Supraphon SUP CD7303
Sinfonietta; Taras Bulba: Vienna Philharmoniker; Charles Mackerras cond.
Decca 410 138-2
Sinfonietta; Taras Bulba: Philharmonia Orch; Simon Rattle cond.
EMI 747048
Sinfonietta; Taras Bulba: Czech Phil Orch; Neumann cond.
Supraphon SUP CD7056

JANEQUIN
Song of the Birds: Ensemble Clement Janequin.
Harmonia Mundi HM 90.1099

JONGEN
Sinfonia concertante; plus — fantasy and pastorale (Franck).
Telarc 80096

JOPLIN, Scott
Easy Winners: Andre Previn.
EMI 747170

JOSQUIN
Music: Choir of New College, Oxford.
Meridian ECD-84 093

KETELBY
In a Monastery Garden; Bank Holiday; In a Persian market; Sanctuary of the Heart; Dance of the Merry Widow, etc; Laurence Dale; Michael Reeves; Ambrosian Chorus; London Promenade Orch; Alexander Faris cond.
Philips (ADD) 400 011-2

KHACHATURIAN
Violin concerto: Itzhak Perlman, violin; Israel Phil Orch; Zubin Mehta cond.
EMI 747087

KODALY
Choral Music: Hungarian Radio and TV Chorus; Janos Ferencsik cond.
Hungaraton HCD 12352-2

Hary Janos suite; plus — Lieut Kije suite (Prokofiev): London Philharmonic Orch; Klaus Tennstedt cond.
EMI 747109
Hary Janos suite, concerto: Janos Ferencsik.
Hungaraton HCD 12190-2
String quartets No 1 and No 2: Kodaly Quartet.
Hungaraton HCD 12362-2
The Peacock; Galanta dances; Marosszek dances: Budapest Symphony Orch; Lehel cond.
Hungaraton HCD 12252-2

KORNGOLD, Eric
Sinfonietta.
Varese Sarabande 47214

KREISLER
Violin transcriptions: Sitkovetsky; Canino.
Orfeo ORF CO48

LA FOLIA
Variations on Folies d'Espagne: Atrium Musicae.
Harmonia Mundi HM 90.1050

LALO
Cello concerto; plus — cello concerto (Saint-Saens): Yo-Yo Ma, cello; Orch Nat de France; Lorin Maazel cond.
CBS CD 35848
Cello concerto; plus — Saint-Saens: Cello concerto No 2; Faure: Elegy: Lyn Harrell, cello; RSO Berlin; Ricardo Chailly cond.
Decca 414 387-2
Cello concerto; Symphonie Espagnole: P. Amoyal and Lodon, cellos; Phil Orch, Charles Dutoit cond; Monte Carlo Opera Orch; Paul Paray cond.
Erato ECD-88 114
Symphonie Espagnole; plus — Reverie and Caprice (Berlioz): Itzhak Perlman; Orch de Paris; Daniel Barenboim cond.
DG (DDD) 400-032-2
Symphonie Espagnole; plus violin concerto No 1 (Saint-Saens): Kyung Wha Chung, Orchestre Symphonique de Montreal;
Charles Dutoit cond.
Decca 411 952-2

LECOCQ
Mam'zelle Angot (ballet); plus-Weber: Invitation to the Dance; Berlioz: Les Toyens a Carthage — (ballet music): National Philharmonic Orch; Richard Bonynge cond.
Decca 411 898-2

LEGNANI
10 Caprices from Op. 20; plus — Giuliani, Paganini, Diabelli: Eduardo Fernandez, guitar.
Decca 414 160-2

LEHAR
The Czarevich — complete opera: Lucia Popp; Rene Kollo; Munich Radio Orch; Wallberg cond.
Ariola-Eurodisc 610 137-232 (2CDs)
The Merry Widow: Mirjana Irosch, soprano; Dagmar Koller, soprano; Helga Papouschek, soprano; Peter Minich, tenor; Herbert Prikopa, tenor; chorus and orch Wiener Volksoper, Rudolf Bibl

cond.
Denon C37-7384-5 (two CDs)
Waltzes: Vienna Johann Strauss Orch, Willi Boskovsky cond.
EMI 747020

LEONCAVALLO
I Pagliacci — complete opera; plus — Cavalleria Rusticana (Mascagni): Lucia Popp; Atlantov; Weikl; Munich Radio Chorus and Orch; Gardelli cond.
Ariola-Eurodisc 610 173-233 (3 CDs)
Pagliacci: Placido Domingo; Teresa Stratas; Juan Pons; Alberto Rinaldi; Forindo Andreolli; chorus and Orch of La Scala, Milan; Georges Pretre cond.
Philips (ADD) 411 484-2

LISZT
Apres une lecture du Dante; 6 chants Polonais de Frederic Chopin; Funerailles: Claudio Arrau.
Philips (DDD) 411 055-2
Consolations; Reve d'Amour; Paraphrases; etc: Jorge Bolet, piano.
Ensayo 3406
Dezso Ranki Plays Franz Liszt: Dezso Ranki, piano.
Denon C37-7547
Fantasy and fugue on the chorale 'Ad nos, ad salutarem undam'; plus — Organ sonata: the 94th Psalm (Reubke): Simon Preston, organ
DG (DDD) 415 139-2
Faust Symphony: John Alor, tenor; Rotterdam Philharmonic Orch; James Conlon cond.
Erato ECD-88 068
Liebestraume; Reves d'Amour; Sogni d'Amore, Op 62, 1-3; plus — Moments Musicaux (Schubert); Lieder ohne Worte (Mendelssohn): Daniel Barenboim, piano.
DG (ADD) 415 118-2
Liszt Jubilee: preludes; Danse Macabre; Hungarian Fantasy; Mephisto Waltz: France Clidat, piano; Radio TV Luxembourg Symphony Orch; Jean-Claude Casadesus cond.
Forlane UCD-16 516
Mephisto waltzes; Benediction; Bagatello; Cyprien Katsaris, piano.
Teldec 8.42 829
Piano concertos No 1 and No 2; fantasia on Hungarian folk themes; Francois-Rene Duchable, piano; London Philharmonic Orch; James Conlon cond.
Erato ECD-88 035
Piano concerto No 1; plus — piano concerto No 1 (Chopin): Martha Argerich, piano; London Symphony Orch; Claudio Abbado cond.
DG (ADD) 415 061-2
Piano concertos Nos 1 & 2: Sviatoslav Richter, piano; London Symphony Orch; Kirill Kondrashin cond.
Philips (ADD) 412 006-2
Piano transcription of Symphony No 3 'Eroica' (Beethoven): Cyprien Katsaris, piano.
Teldec 8.43 201
Piano transcription of Symphony No 6 'Pastorale' (Beethoven): Cyprien Katsaris, piano.
Teldec 8.42 781
Piano transcription of Symphony No 7 (Beethoven): Cyprien Katsaris, piano.
Teldec 8.43 113
Piano transcription of Symphony No 9 (Beethoven): Cyprien Katsaris, piano.
Teldec 8.42 956
Piano Works, Vol. 1: La Campenella; Mephisto Waltz; Liebestraum etc: Jorge Bolet.
Decca 410-257-2
Piano Works, Vol. II: Schubert songs transcriptions: Jorge Bolet.
Decca 414 575-2
Piano Works, Vol. III: Sonata in B minor; Liebestraum; etc: Jorge Bolet.
Decca 410 115-2
Piano Works, Vol. IV: Annes de Pelegrinage — Italie: Jorge Bolet.
Decca 410 161-2
Piano Works, Vol. V: Annes de Pelegrinage — Suisse: Jorge Bolet.
Decca 410 161-2
Piano Works, Vol. VI: Venzia e Napoli; Les Jeux d'eau a la Villa d'Este; Benediction de Dieu dans la Solitude etc: Jorge Bolet.
Decca 411 803
Preludes; Orpheus; Tasso: Hungarian State Orch; Janos Ferencsik cond.
Hungaraton HCD 12446-2
Sonata in B minor: Legendes Die Trauergondel Nos 1 & 2: Alfred Brendel.
Philips (DDD) 410 040-2
Sonata in B minor; 2 Legends; Benediction de Dieu dans la Solitude; Francois-Rene Duchable, piano.
Erato ECD-88 091
St Francis Legends: Gronroos; Berlin Radio Symphony Orch; Albrecht cond.
Schwann SCH 11619
Symphony No 2 'Dante'.
Varese Sarabande 47207
Thibaudet Plays Liszt: Faust Paraphrase S407; Six Consolations S172: Rigoletto Paraphrase S434: Jean-Yves Thibaudet, piano.
Denon C37-7332
Totentanz: Danse Macabre; Malediction; Fantasia on Hungarian folk themes: Jorge Bolet.
Decca 414 079-2
Transcendental Etudes: Jorge Bolet, piano.
Ensayo 3401

LOEWE
Balladen: Hermann Prey, baritone
EMI 860850

LULLY
Te Deum; Dies Irae: soloists; Ensemble 'A Coeur Joie' de Valence; Jean-Francois Paillard Chamber Orchestra, J-F Paillard cond.
Erato ECD-88 122

LUTOSLAWSKI
Variations on a Theme by Paganini; plus — suite No 2 Op. 17 (Rachmaninov); La Valse, Ravel: Martha Argerich, piano; Nelson Freire, piano.
Philips (DDD) 411 934-2

MAHLER
Das Klagende Lied: Simon Rattle cond.
EMI 747089
Dad Lied von der Erde: Jessye Norman; Jon Vickers; London Symphony Orch; Colin Davis cond.
Philips (DDD) 411-474-2
Das Lied von der Erde: Ludwig Wunderlich; Philharmonia Orch; Otto Klemperer cond.
EMI 747231
Das Lied von der Erde: Kathleen Ferrier; Julis Patzak, Wiener Philharmoniker; Bruno Walter cond.
Decca 414 194-2
Lieder eines fahrenden Gesellen; 4 Rueckert-lieder; Kindertotenlieder; Dietrich Fischer-Dieskau, baritone; Symphonie Orch des Rundfunks, Rafael Kubelik; Berlin Philharmonic Orch; Karl Boehm cond.
DG (ADD) 415-191-2
Songs of a Wayfarer; plus — Les Nuits d'Ete (Berlioz); Agnes Balltsa; Gewandhausorchester Leipzig; Kurt Masur cond.
Philips (DDD) 412-744-2
Symphony No 1 in D 'Titan': Frankfurt Symphony; Eliahu Inbal cond.
Denon C37-7537
Symphony No 10: Philadelphia Orch; James Levine cond.
RCA RCD24553
Symphony No 1: Chicago Symphony Orch; Claudio Abbado cond.
DG (DDD) 400 033-2
Symphony No 1; Riccardo Muti.
EMI 747032
Symphony No 1: New York Philharmonic Orch; Zubin Mehta cond.
CBS CD37273
Symphony No 2 in C minor 'Resurrection': London Phil Orch; Klaus Tennstedt cond.
EMI 747041
Symphony No 2 in C minor 'Resurrection': St Louis Symphony Orch; Leonard Slatkin cond.
Telarc 80081/82 (2 CDs)
Symphony No 2: Vienna Philharmonic Orch; Lorin Maazel cond.
CBS CD 38667
Symphony No 3: Chicago Symphony Orch; James Levine cond.
RCA RCD21757
Symphony No 3: Christa Ludwig; Czech Phil Orch; Neumann cond.
Supraphon SUP CD 7288/89 (2CDs)
Symphony No 3: Jessye Norman; Konzertvereinigung; Vienna Staatsoperchor; Vienna Boys Choir; Vienna Philharmonic Orch; Claudio Abbado cond.
DG (DDD) 410 715-2 (2CDs)
Symphony No 4 — Bruno Walter; plus — Symphony in 3 movements (Stravinsky) — Furtwangler.
Varese Sarabande 47228
Symphony No 4 in G: Chicago Symphony Orch; James Levine cond.
RCA RCD10895
Symphony No 4: Kathleen Battle, soprano; Vienna Philharmonic Orch; Lorin Maazel cond.
CBS CD 39072
Symphony No 4: Lucia Popp, soprano; London Phil Orch; Klaus Tennstedt cond.
EMI 747024
Symphony No 4: Frederica von Stade; Vienna Philharmonic Orch; Claudio Abbado cond.
DG (DDD) 413 454-2
Symphony No 5 in C sharp minor; adagio from Symphony No 10 in F sharp: London Philharmonic Orch; Klaus Tennstedt cond.
EMI 747104
Symphony No 5; Kindertotenlieder: Christa Ludwig; Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (ADD) 415 096-2 (2 CDs)
Symphony No 6 'Tragic': Christa Ludwig; Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (ADD) 415 099-2 (2 CDs)
Symphony No 6: London Phil Orch; Klaus Tennstedt cond.
EMI 747050
Symphony No 7: Chicago Symphony Orch; Claudio Abbado cond.
DG (DDD) 413 773-2 (2 CDs)
Symphony No 8: Benackova; Nielsen; Moser; Novak; Czech Phil Orch; Neumann cond.
Supraphon SUP CD7307/08 (2 CDs)
Symphony No 9 in D minor: London Philharmonic Orch; Klaus Tennstedt cond.
EMI 747113
Symphony No 9: Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 410 726-2 (2 CDs)
Symphony No 9: Czech Phil Orch: Neumann cond.
Supraphon SUP CD7340/41 (2 CDs)
Symphony No 1: Chicago Symphony Orch; Georg Solti cond.
Decca 411-731-2
Symphony No 2: Resurrection; Buchanan, Zakai, Chicago Symphony Orch and Chorus; Georg Solti cond.
Decca 410 202-2 (2 CDs)
Symphony No 3: Helga Dernesch; Chicago Symphony Orch and Chorus: George Solti cond.
Decca 414 268-2 (2 CDs)
Symphony No 4: Roberta Alexander, soprano; Concertgebouw Orch Amsterdam; Bernard Haitink cond.
Philips (DDD) 412 119-2
Symphony No 4: Kiri Te Kanawa, Chicago Symphony Orchestra and Chorus; Georg Solti cond.
Decca 410 188-2
Symphony No 5: Chicago Symphony Orch and Chorus; George Solti cond.
Decca 414 321-2
Symphony No 7: Concertgebouw Orch Amsterdam, Bernard Haitink cond. Roberta Alexander, soprano; Concertgebouw Orch Amsterdam; Bernard Haitink cond.
Philips (DDD) 410 398-2 (2CDs)
Symphony No 8, Symphony of a Thousand: Faye Robinson; Judith Blegen; Deborah Sasson; Florence Quivar; Lorna Myers; Kenneth Riegel; Benjamin Luxon; Gwynne Howell; Tanglewood Festival Chorus; Boston Boy Choir; Boston Symphony Orch; Seiji Ozawa cond.
Philips (DDD) 410 607-2 (2CDs)
Symphony No 8: Harper; Popp; Auger; Minton; Watts; Kollo; Shirley-Quirk; Talvela, Chor der Wiener Staatsoper, Chor des Wiener Musikvereins, Chicago Symphony Orch; Georg Solti cond.
Decca 414 493-2 (2CDs)
Symphony No 9: Chicago Symphony Orchestra, Georg Solti cond.
Decca 410 012-2 (2 CDs)
The Song Of The Earth: Brigitte Fassbaender; Francisco Araiza; Berlin Philharmonic Orch, Carlo Maria Giulini cond.
DG (DDD) 413 459-2

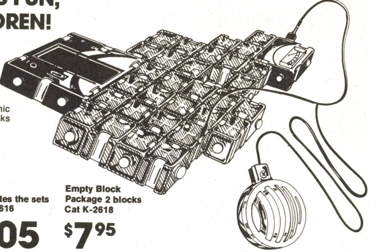
MASCAGNI
Cavalleria Rusticano: Elena Obraztsova; Placido Domingo; Renata Bruson a.o.; coro and Orch del Teatro all Scala Milano, George Petre cond.
Philips (ADD) 416 137-2

MENDELSSOHN
A Midsummer Night's Dream (complete): Arleen Auger; Ann Murray; Ambrosian Singers; Philharmonia Orch; Neville Marriner cond.
Philips (DDD) 411 106-2
Five symphonies; overtures — Midsummer Night's Dream, Hebrides, Fair Melusina: London Symphony Orch; Claudio Abbado cond.
DG (DDD) 415 353 (4CDs)
Lieder Ohne Worte — selection; plus — Liebestraume (Liszt); Moments

BLOC-TRONICS IS EASIEST IN LEARNING ELECTRONICS!

IT'S THE NEW STANDARD THAT'S FUN, CREATIVE AND SAFE FOR CHILDREN!

BLOC-TRONICS is a revolutionary method for youngsters to learn electronics and build projects. It's an alternative to soldering, using inter-connecting cubic blocks containing electronic elements with multi-sided contact points. These slot together to form circuits. And by following the BLOC-TRONICS manual, you can build a variety of projects. BLOC-TRONICS is available in 3 configurations. Each builds upon the other with more components. PLUS there are empty BLOCS available for inserting your own electronic elements. BLOC-TRONICS can be the building blocks to your child's future.

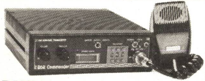


KIT A
Starter Set
K-2612
$39.95

SET 1
Builds on Set A
Cat K-2614
$39.95

SET D
Completes the sets
Cat K-2616
$105

Empty Block
Package 2 blocks
Cat K-2618
$7.95



BUILD A 2M UHF TRANSCEIVER

Brilliant! Build it yourself and save $$$. It boasts all the features. +/- 600kHz offsets, anti repeater, 5kHz offset and more. Selectivity is better than 60dB at +/- 25kHz.
Cat K-6308 **We export to the USA** **$189**

13.8V 2A POWER SUPPLY KIT

A very affordable accessory for UHF/VHF transceivers. Supplies 13.8 volts, regulated at 2 amps continuous. Comes complete with all necessary parts and instructions.
Cat K-6310 **$49.95**

Cat K-6318

RTTY DECODER FOR VZ-200/300 COMPUTER

Fantastic! Low cost entry into teletype. It's easy to build and install ... interfaces straight into expansion port. Features 1K write ahead and WRU buffers, 7 pre-programmed EPROM messages and single letter commands.

Decode news broadcasts or work your local RTTY repeaters! **$69.50**

TRIPLE THE FUN & VALUE

This is it! Funway I, II, III gift box — combines all the fun, excitement and experiments of the Funway series. If you bought the series individually, you'd pay over $70. Now save.
Cat K-2680. **$49.95**

FUNWAY JUMBO BOX

WOW! Talk about value. Contains over 30 fascinating projects PLUS a DSE soldering iron.
Cat K-2690 **SAVE $40** **$89.95**

FUNWAY 1 GIFT BOX

Value! There's the great Funway I book and components. PLUS a handy component tray. Contains 20 projects.
Cat K-2605 **$15**

FUNWAY 11 GIFT BOX

It's all here! The Funway 2 book, soldering iron and solder, 9V battery and 'Wireless Mic' kit.
Cat K-2620 **$15**

SAVE NOW ON FUNWAY III

		Save	
Funway III Auto Minder	K-2660	$1	$3.95
Funway III Two-up	K-2661	$1	$5.95
Funway III Pokey	K-2662	$3	$11.95
Funway III Cricket	K-2663	$2	$7.95
Funway III Mini Colour Organ	K-2664	$1	$5.95
Funway III Light and Sound	K-2665	$2	$4.95
Funway III Combined Timer Lock	K-2666	$2	$7.95
Funway III Mini Amp	K-2667	$3	$11.95
Funway III Binary Bingo	K-2668	$2	$10.95
Funway III Mini Synth	K-2669	$2	$10.95
Funway III Bonus Pack	K-2670	Over $4	$19.95

DICK SMITH ELECTRONICS
PTY LTD

For Address details See P98

B112/RB

Musicaux (Schubert): Daniel Barenboim, piano.
DG (ADD) 415 118-2
Midsummer Night's Dream — incidental music: London Phil Orch; Choir of Kings College School, Arpad Joo cond.
Sefel SEF-CD 5025
Midsummer Night's Dream — selection; plus — Rosamunde (Schubert); Judith Blegen; Florence Quivar; Chicago Symphony Chorus and Orch; James Levine cond.
DG (DDD) 415 137-2
Midsummer Night's Dream: Incidental music: Choir Kings College School, Wimbledon; London Philharmonia Orch/Joo.
Sefel SEFD 5025 CD
Midsummer Night's Dream; etc: London Symphony Orch; Andre Previn cond.
EMI 747163
Motets: Collegium Vocale, Herrewghe cond.
Harmonia Mundi HM 90.1142
Organ works: Marie-Claire Alain, organ.
Erato ECD-88 112
Piano works: Murray Perahia, piano.
CBS CD37838
Psalms 42, 95, 115: Brunner, Ramirez; Huttenlocher; Gulbenkian Foundation Choir and Symphony Orch; Corboz cond.
Erato ECD-88 120
Sonata Op 6; sonate ecossaise, etc: Lydia Artymiw, piano.
Chandos CHAN-8326
Symphony No 3 'Scottish', overture — Midsummer Night's Dream: Bavarian Radio Symphony Orch; Colin Davis cond.
Orfeo ORF C089
Symphony No 4 in A 'Italian'; and No 5 in D minor 'Reformation'. Hungarian State Orch; Ivan Fischer cond.
Hungaraton HCD 12414-2

Symphony No 3 'Scottish'; Symphony No 4 'Italian': Academy of St Martin-in-the-Fields', Neville Marriner cond.
Argo (ZH) 411-931-2
Violin concerto in D minor; piano concerto in A minor: Thomas Zehetmair, violin; Cyprien Katsaris, piano; Franz List Chamber Orch; Budapest.
Teldec 8.43 061
Violin concerto in E minor, Op 64; also — violin concerto No 1 in G minor (Bruch): Jean-Jacques Kantarow, violin; Netherlands Chamber Orch; Antoni Ros-Marba cond.
Denon C37-7123
Violin concerto in E minor, Op 64. Octet Op. 20: St. Paul Chamber Orch; Pinchas Zukerman, violin and director.
Philips (DDD) 412-212-2
Violin concerto in E minor: Cho-Liang Lin, violin.
CBS CD339007
Violin concerto in E minor; plus — violin concerto (Bruch): Itzhak Perlman, violin; London Symphony Orch; Andre Previn cond.
EMI 747074
Violin concerto, Op 64 (version for flute): Andras Adorjan, flute; Stuttgart Radio Symphony Orch; Shallon cond.
Orfeo ORF C046
Violin concerto; overtures Ruy Blas, Midsummer Night's Dream and Hebrides: Joseph Silverstein, violin; Utah Symphony Orch: Joseph Silverstein cond.
Pro Arte PA-CDD 187
Violin concerto; plus — violin concerto (Saint-Saens): Cho-Liang Lin, violin, Philharmonia Orch; M. Tlson-Thomas cond.
CBS CD 39007
Violin concerto; plus — violin concerto No 1 (Bruch): Anne-Sophie Mutter; Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 400 031-2
Violin concerto; plus — violin concerto (Tchaikovsky): Kyung Wa Chung, Orch Symphonique de Montreal; Charles Dutoit cond.
Decca (DH) 410-011-2

MEYERBEER

Gli Amore di Teolinda: Varady; Berlin Radio Symphony Orch; Albretch cond.
Orfeo ORF C054

MILHAUD

Chamber music: Nicolet; Holliger; Brunner; Maisenberg.
Orfeo ORF C060

MONTEVERDI

Alti Canti: Les Arts Florissants, Christie.
Harmonia Mundi HM 90.1068
Balli-Balletti: soloists; Monteverdi Choir; English Baroque Soloists; John Eliot Gardiner cond.
Erato ECD-88 032
Coronation of Poppea: Donath; Soderstom; Berberian; Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.35 247 (4 CDs)
Il Ballo Delle Ingrate; La Sestina: Les Arts Florissants, Christie.
Harmonia Mundi HM 90.1108
Il Combattimento di Tancredi & Clorinda; Madrigal Book: Wener Hollweg; Trudeliese Schmidt; Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.43 054
Lamento d'Arianna: Concerto Vocale.
Harmonia Mundi HM 90.1129
Madrigals; various performers.
Erato ECD-88 108
Motets: Nelson; Jacobs; Christie; Concerto Vocale.
Harmonia Mundi HM 90.1032
Orfeo — complete opera: A. Michael; C. Watkinson; G. Quilico; Ensemble Vocal de la Chapelle Royale; Lyon Opera Orch; Corboz cond.
Erato ECD-88 133 (2 CDs)
Orfeo — complete opera: Concentus Musicus Vienna; Nikolaus Harnoncourt cond.
Teldec 8.35 020 (2 CDs)
Orfeo: Rogers; Medlam.
EMI 747142
Sacred vocal music: Emma Kirkby, Ian Partridge, Parley of Instruments.
Hyperion HYP CDA66021
Vespers: Taverner Consort and Choir, Andrew Parrott cond.
EMI 747078
Vespro della Beata Vergine: soloists; Ensemble Instruments Anciens; Lausanne Vocal Ensemble; Corboz cond.
Erato ECD-88 024 (2 CDs)
Virtuoso madrigals and sacred concertos: Ian Partridge; Nigel Rogers; Christopher Keyte; Monteverdi Chor Hamburg; Colin Tilney, harpsichord; Jurgen Jurgens, dir.
Archiv (ADD) 415 295-2

MOZART W. A.

Isaac Stern 60th Anniversary Concert — sinfonia concertante in E flat major; plus — concerto for three violins; concerto in D minor for two violins and orch (Bach); Pinchas Zukerman, Itzhak Perlman, Isaac Stern, violins; New York Philharmonic, Zubin Mehta cond.
CBS CD 36692
Quartet in F major, K370; adagio in C major, K58Oa; quintet in C minor, K406; Hansjorg Schellenberger, oboe and English horn; Philharmonia Quartet Berlin.
Denon C37-7034
'London' serenades: Stuttgart Chamber Orch, Karl Munchinger cond.
EMI 860953
'Posthorn' Serenade; Eine Kleine Nachtmusik; Vienna Philharmonic Orch, James Levine cond.
DG (DDD) 410 085-2
Arias from Die Zauberflote (Ach, ich fuhl's); Cosi fan tutte (Ei parte Senti; Per pieta, ben mio, perdona); Idomeneo; La finta giardiniera; Lucio Silla; Il re pastore: Kiri Te Kanawa, soprano; London Symphony Orch; Colin Davis cond.
Philips (DDD) 411 148-2
Church sonatas: London Baroque Ensemble.
Harmonia Mundi HM. 90 1137
Clarinet concerti.
Erato ECD-88 127
Clarinet concerto; concerto for flute and harp; Alfred Prinz; Nicanor Zabaleta, harp; Wolfgang Schulz; Vienna Philharmonic Orch, Karl Boehm cond.
DG (ADD) 413 552-2
Clarinet quartets; D. Kloecker, clarinet; members of Eder Quartet.
Teldec 8.43 046
Clarinet quintet; clarinet trio; Michel Portal, clarinet; Les Musiciens.
Harmonia Mundi HM 90.1118
Complete sonatas for piano, Vol 1: No 1 in C major, K279; No 2 in F major, K280; No 3 in B flat major, K281; No 4 in E flat major, K282; No 5 in G major, K283; Maria Joao Pires, piano.
Denon C37-7386
Complete sonatos for piano, Vol 2: No 6 in D major, K284; No 7 in C major, K309; No 8 in A minor, K310; rondo in D major, K485; Maria Joao Pires, piano.
Denon C37-7387
Complete sonatas for piano, Vol 3: No 9 in D major, K311; No 10 in C major, K330; No 11 in A major, K 331; rondo in A minor, K511; Maria Joao Pires, piano.
Denon C37-7388
Complete sonatas for piano, Vol 4: No 12 in F major, K332; No 13 in B flat major, K333; fantasia in C minor, K475; sonata No 14 in C minor, K457; Maria Joao Pires, piano.
Denon C37-7389
Complete string quartet No 2; Kocian Quartet.
Denon C37-7538
Complete sonatas for piano, Vol 5: No 15 in F major, K533; No 16 in F major, K545; No 17 in B flat major, K570; No 18 in D major, K576; fantasia in D minor, K397; Maria Joao Pires, piano.
Denon C37-7390.
Concert Arias: Kiri Te Kanawa. Wiener Kammerorchester, Gyorgy Fischer cond.
Decca 411 713-2
Concerto for flute and harp; plus — harp concerto in C major (Boieldieu): Lilly Laskine, harp, Jean-Francois Paillard Chamber Orch; J-F Paillard cond.
Erato ECD-88 069
Concerto No 23 in A major, K488; and No 17 in G major, K453; Richard Goode, piano; Orpheus Chamber Orch.
WEA 79042-2
Concertos for horn, No 1-4; Gunter Hoegner; Vienna Philharmonic Orch; Karl Boehm cond.
DG (ADD) 413 792-2
Coronation mass, K317; Missa Solemnis, K337; Soloists; English Chamber Orch, Kings College Choir, Cambridge. Steven Cleobury cond.
Argo (ZH) 411 904-2
Cosi Fan Tutte: Yaker; Nafe; Resick; Feller; Drottningholm Court Theatre Orch and Chorus, Arnold Ostman cond.
L'Oiseau-Lyre 414 316-2
Divertimento (string trio) in E flat major, K563; Mozart String Trio.
Denon C37-7199
Divertimento in E flat: Cummings Trio.
Meridian ECD-84 079
Divertimento No 17 in D major, K334; divertimento No 1 in D major, K136; Philharmonia Quartet Berlin; Norbert Hauptmann, horn; Dieter Fischer, bass; Wolfgang Guetter, contrabass.
Denon C37-7080
Divertimentos, K136-138; serenade in D, K239 'Serenata notturna'; I Musici.
Philips (DDD) 412 120-2
Divertimento in D, K334, march in D, K445; Academy of St Martin-in-the Fields' Chamber Ensemble.
Philips (DDD) 411 120-2
Don Giovanni: Glyndebourne Chorus; London Phil Orch, Bernard Haitink cond.
EMI 747037
Double concerto for two pianos, K365; plus — fantasy for two pianos (Corea); Ping-pong for two pianos (Gulda); Chick Corea and Friedrich Gulda, pianos; Concertgebouw Orch Amsterdam, Nikolaus Harnoncourt cond.
Teldec 8.42 961
Eine Kleine Nachtmusik; six German dances; Les Petits Riens; Scottish Chamber Orch, Raymond Leppard cond.
Erato ECD-88 014
Eine Kleine Nachtmusik, K525; clarinet quintet, K581; Vienna Chamber Ensemble.
Ariola-Eurodisc 610 129-231
Eine Kleine Nachtmusik; A Musical Joke; Scherzo Musicale; Amadeus Quartet; Rainer Zepperitz; Gerd Seifert; Manfred Klier.
DG (DDD) 400 065-2
Eine Kleine Nachtmusik; plus — Holberg suite (Grieg); Symphonie Classique (Prokofiev); Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 400 034-2
Eine Kleine Nachtmusic; 'Postarn' serenade.
Telarc 80108
Eine Kleine Nachtmusik: Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 411 720-2
Exsultate Jubilate; Vesperae solennes de confessore; Kyrie in D minor; Ave Verum Corpus; Kiri Te Kanawa, soprano; London Symphony Orch, Colin Davis cond.
Philips (ADD) 412 873-2
Exsultate Jubilate, K165; Regina coeli, K108; Ergo interest, K143; Regina coeli, K127; Emma Kirkby, Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 411 832-2
Exsultate Jubilate; arias: Janet Baker,

mezzo.
Erato ECD-88 090

Fantasy and sonatas, K475/457,533/494: Paul Badura-Skoda, piano.
Astree E7703

Flute concerto No 1 in G, K313; oboe concerto in C, K314: Werner Tripp, Gerhard Turetschek; Vienna Philharmonic, Karl Boehm cond.
DG (ADD) 413 737-2

Flute concerto No 1, K313; No 2, K314; concerto for flute and harp, K622: Jean-Pierre Rampal, flute; Marielle Nordmann harp; Jerusalem Chamber Orch, Isaac Stern cond, English Chamber Orch, Rampal cond.
Erato ECD-88 106

Flute concertos No 1 and 2; andante for flute and orch: W. Schultz, flute; Mozarteum Orch, Leopold Hager cond.
Teldec 8.42 185

Flute concertos: James Galway, flute; Festival Strings Lucerne, Rudolf Baumgartner cond.
Ariola-Eurodisc 610 130-231

Flute quartets: B. Kuijken; S. Kuijken; Lucy van Dael; W. Kuijken.
Accent ACC 48225

Four concertos for horn and orchestra: Zdenek Tyslar, horn; Prague Chamber Orch.
Denon C37-7432

Four early quartets — in F major, K168; in C major, in G minor, K156; Sequioa String Quartet.
WEA 79026-2

Four flute quartets: in D major, K285; G major, K285a; C major, K Anh 171 (285b); A major K298; Aurele Nicolet, flute; Mozart String Quartet.
Denon C37-7157

Great Mass: Barbara Hendricks; Janet Perry; Peter Schreier; Benjamin Luxon; Vienna Singverein; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 400 067-2

Horn concerto No 3, K447; bassoon concerto, K191; oboe concerto, K314; plus — trumpet concerto (Haydn); Dale Clevenger; Willard Elliot; Ray Still; Adoph Herseth; Chicago Symphony Orch, Claudio Abbado cond.
DG (DDD) 415 104-2

Horn concertos No 1-4 Barry Tuckwell, horn; English Chamber Orch.
Decca 410 284-2

Horn concertos: Hermann Baumann, horn; Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.41 272

Idomeneo — complete opera: Hollweg; Schmidt; Yakar; Mozart Orch and Chorus of Zurich Opera House, Nikolaus Harnoncourt cond.
Teldec 8.35 547 (3 CDs)

Le Nozze di Figaro, K492, highlights; also — Overture Sho Jo Ji (Soeleman); Serenade (Seiber); etc; Netherlands Wind Ensemble.
Denon C37-7124

Le Nozze di Figaro: Te Kanawa; von Stade; Popp; Allen; Ramey, London Philharmonic Orch, Sir Georg Solti cond.
Decca (DH3) 410 150-2 (3 CDs)

March in D major, K249; Serenade No 7 in D major, K250 'Haffner'. Thomas Zehetmair, violin; Staatskapelle Dresden, Nikolaus Harnoncourt cond.
Teldec 8.43 062

Mass in C minor, K427; Lake, Denes, Equiluz; Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.43 120

Mass in C, K317, Coronation inter natos mulerium, K72; Missa Brevis in C, K220, Sparrow Mass; Vienna Boys Choir; Vienna Symphony Orch, Uwe Christian Harrer.
Philips (DDD) 411 139-2

Missa Brevis in C, K258; Missa Longa in C, K262: Mitsuko Shirai; Marga Schiml; Armin Ude; Hermann-Christian Polster; Leipzig Radio Chorus; Dresden Philharmonic Orch, Herbert Kegel cond.
Philips (DDD) 416 273-2

More of the best of Mozart: Alfred Brendel; Neville Marriner; Colin Davis (and others).
Philips (DDD) 416 273-2

Oboe quartet, K370; divertimento, K251; adagio, K580; Orlando quartet; Heinz Holliger, oboe; Hermann Baumann, horn.
Philips (DDD) 412 618-2

Operatic and concert arias: Barbara Hendricks, soprano.
EMI 747122

Operatic arias: Lucia Popp, soprano.
EMI 747019

Overtures: Academy of St Martin-in-the-Fields, Neville Marriner cond.
EMI 747014

Piano concerto No 14 in E flat, K449; and No 18 in B flat, K456; Diana Ambache, piano; Ambache Chamber Ensemble.
Meridian ECD-84 086

Piano concerto No 23 in A, K488; and

This survey of compact discs has been compiled from listings supplied by all major Australian distributors.

Classical records are catalogued by composer. Pop records — a category we have stretched to include rock, jazz, blues, folk, instrumental and country — are catalogued by artist(s).

Some catalogues which have been published in this country — and indeed in others — are very skimpy on details of artists and works. We have tried to put in as much detail as possible, particularly with classical CDs, consistent with the restrictions of publishing space, without resorting to the use of symbols and contractions with meanings which are hard to remember.

We have, however, retained the useful coding system used by Polygram's Philips and Deutsche Grammophon labels. Numbers of these records are followed by the letters DDD, ADD or AAD to indicate the degree of digital recording technology used in various stages of production. DDD indicates digital tape recorder used during session recording, mixing and/or editing, and final mastering (transcription). ADD indicates analogue tape recorder for session recording, digital equipment for mixing and/or editing and mastering. And AAD indicates analogue recording, mixing/editing and digital mastering.

Numbers and other information throughout are as supplied by the various distributors, and we have put a lot of effort into making the listing as up to date as possible. We have included CDs which were listed for release up to the end of 1985 — but import arrangements can go awry (all CDs sold in Australia are imported). Please bear with us if a few listed CDs turn out to be not available at the time of publication.

We have tried to make the listing as comprehensive as possible. New small importers spring up all the time. If we have missed anyone, we apologise — and ask them to please send information for inclusion in the next survey.

If you have queries about availability of any disc, please contact your record store — or the distributor direct. Following is a list of all major labels and their respective distributors. All have their headquarters in Sydney, with the exception of Teac Aust (Melbourne), PC Stereo (Brisbane) and Another Record Distributor (Hobart).

This catalog has been compiled on a Macintosh computer using Microsoft File by David Frith productions. Below is a list of CD labels and their associated suppliers.

Abbey	Avan-Guard Music
Accent	Argus Music
Accord	Another Record Distributor
Ariola-Eurodisc	Carinia Records
ASV	Another Record Distributor
Asylum	WEA Records
Atlantic	WEA Records
Bellaphon	PC Stereo
BIS	Avan-Guard Music
Black Saint	Avan-Guard Music
Capriccio	PC Stereo
CBS	CBS Records
Chandos	Carinia Records
Chant du Monde	Argus Music
CRD	Argus Music
Decca	Polygram
Delos	PC Stereo
Denon	Teac Aust
DG (Deutsche Grammophon)	Polygram
Durium	Avan-Guard Music
ECM	Carinia Records
Elektra	WEA
EMI	EMI Records
Ensayo	Argus Music
Erato	Carinia Records
Etcetera	Another Record
Festival	Festival Records
Forlane	Carinia Records
GRP	PC Stereo
Harmonia Mundi (Fr)	Argus Music
Harmonia Mundi (German)	Carinia Records
HK (Hong Kong)	Argus Music
HK Marco Polo	Argus Music
Hungaraton	Another Record Distributor
Hyperion	Argus Music
Lodia	Argus Music
MCA	WEA Records
Meridian	Carinia Records
Milan	Avan-Guard Music
MMG	Argus Music
Nimbus	Argus Music
Nonesuch	Another Record Distributor
Orfeo	Argus Music
Philips	Polygram Records Pty Ltd Distributor
Piere Verany	Another Record Distributor
Pro Arte	Avan-Guard Music
RCA	RCA Record
Rodolphe	Argus Music
Schwann	Argus Music
Sefel	PC Stereo and Avan-Guard Music
Sheffield Lab	PC Stereo
Sonic Atmospheres	PC Stereo
Soul Note	Argus Music
Southern Cross	PC Stereo
Supraphon	Argus Music
Telarc	PC Stereo
Teldec	Carinia Records
TER	PC Stereo
Tudor	Argus Music
Unicorn	Another Record Distributor
Varese Sarabande	PC Stereo
Vogue	Another Record Distributor
WEA	WEA Records Pty Ltd

Frith Productions on Microsoft File.

No 26 in D, K537 'Coronation': Friedrich Gulda, piano; Concertgebouw Orch Amsterdam, Nikolaus Harnoncourt cond.

Teldec 8.42 970

Piano concerto No 26; rondos in D and A major: Muray Perahia, piano, English Chamber Orch.

CBS CD 39224

Piano concertos No 1 and 4: Murray Perahia, piano, English Chamber Orch.

CBS CD 39225

Piano concertos No 12 and No 14: Malcolm Bilson, fortepiano; The English Baroque Soloists; John Eliot Gardiner, cond.

Archiv (DDD) 413 463-2

Piano concertos No 12 and No 20: Rudolf Serkin, piano; London Symphony Orch, Claudio Abbado cond.

DG (DDD) 400 068-2

Piano concertos No 12 in A; and No 23 in A: Zoltan Kocsis, piano; Liszt Ferenc Chamber Orch.

Hungaraton HCD 12472-2

Piano concertos No 13 and No 15: Malcolm Bilson, fortepiano; The English Baroque Soloists; John Eliot Gardiner, cond.

Archiv (DDD) 413 464-2

Piano concertos No 15 in B flat, K450; and No 17 in G, K453: Deszo Ranki, piano; Liszt Ferenc Chamber Orch, Janos Rolla cond.

Hungaraton HCD 12655-2

Piano concertos No 17 and 18: Murray Perahia, piano; English Chamber Orch.

CBS CD 36686

Piano concertos No 19 and 23: Murray Perahia, piano, English Chamber Orch.

CBS CD 39064

Piano concertos No 19 and No 23: Maurizio Pollini, piano; Vienna Philharmonic Orch, Karl Boehm cond.

DG (ADD) 413 793-2

Piano concertos No 19 and No 25; Rudolf Serkin, piano; London Symphony Orch, Claudio Abbado cond.

DG (DDD) 410 989-2

Piano concertos No 20 in D minor; No 23 in A: Elisabeth Westenholz, piano; Collegium Musicum Copenhagen/Schoenwandt.

BIS BIS CD-283

Piano concertos No 21 and No 23: Rudolf Serkin, piano; London Symphony Orch, Claudio Abbado cond.

DG (DDD) 410 068-2

Piano concertos No 6 and 13: Murray Perahia, piano, English Chamber Orch.

CBS CD 39223

Piano concertos No 8 and No 27: Rudolf Serkin, piano; London Symphony Orch, Claudio Abbado cond.

DG (DDD) 410 035-2

Piano concertos No 9 and No 11: Malcolm Bilson, fortepiano; The English Baroque Soloists; John Eliot Gardiner, cond.

Archiv (DDD) 415 905-2

Piano concertos No 9 and No 17: Rudolf Serkin, piano; London Symphony Orch, Claudio Abbado cond.

DG (DDD) 415 206-2

Piano concertos No 17 and 24: Vienna Philharmonia Orch; Andre Previn, soloist, cond.

Philips (DDD) 412 524-2

Piano concertos No 20 and 24: Clara Haskil; Lamoureux Orch, Markevitch

Philips (ADD) 412 254-2

Piano concertos No 12 and No 13: Vladimir Ashkenazy, piano; Philharmonic Orch.

Decca 410 214-2

Piano concertos No 15 and No 16: Vladimir Ashkenazy, piano; Philharmonic Orch.

Decca 411 433-2

Piano concertos No 15 and No 21: Alfred Brendel; Academy of St Martin-in-the-Fields, Neville Marriner cond.

Philips (DDD) 400 018-2

Piano concertos No 17 and No 21: Vladimir Ashkenazy, piano; Philharmonic Orch.

Decca 411 433-2

Piano concertos No 19 and No 22: Alicia de Larrocha; Wiener Symphoniker, Uri Segal cond.

Decca 410 140-2

Piano concertos No 19 and No 24: Vladimar Ashkenazy, piano; Philharmonic Orch.

Decca 414 433-2

Piano concertos No 23 and 27: Vladimir Ashkenazy, piano; Philharmonic Orch.

Decca 400 087-2

Piano quartet in G minor, K478; piano concerto in E flat, K439: Beaux Arts Trio; Bruni Giurnna, viola.

Philips (DDD) 410 391-2

Piano sonatas in B, K570; in D, K576; adagio in B minor, K540: Claudio Arrau, piano.

Philips (DDD) 411 1360-2

Piano sonatas, K284, 487; fantasy, K475; Maria Joao Pires, piano.

Erato ECD-88 082

Piano sonatas, in A, K331 Alla Turca; in F, K332; fantasia in D minor, K397: Mitsuko Uchida.

Philips (DDD) 412 123-2

Piano sonatas, in C, K330; in B flat, K333; adagio in B minor, K540; gigue, K574; Mitsuko Uchida.

Philips (DDD) 412 616-2

Piano sonatas, in C, K545; in F, K 533; Rondo in A minor, K511: Mitsuko Uchida.

Philips (DDD) 412 122-2

Quintet in C minor, K406; quintet in E flat major, K614; Josef Suk, viola; Smetana Quartet.

Denon C37-7179

Quintet in A major, K581; plus — Introduction, theme and variations in B flat major (Weber): Sabine Meyer, clarinet; Philharmonia Quartet Berlin.

Denon C37-7038

Quintet in B flat major, K174; Quintet in D major, K593: Josek Suk, 1st viola; Smetana Quartet.

Denon C37-7075

Quintet in E flat major for horn, violin, two violas and cello; serenade in G major; A Musical Joke: Philharmonia Quartet Berlin; Norbert Hauptmann, horn.

Denon C37-7229

Requiem, K626: Kirkby; Watkinson; Rolfe-Johnson; Thomas, Academy of Ancient Music, Christopher Hogwood cond.

L'Oiseau-Lyre 411 712-2

Requiem, K626: Margaret Price: Trudeliese Schmidt; Francisco Araiza; Theo Adam; Radio Chorus Leipzig; Staatskapelle Dresden, Peter Schreier cond.

Philips (DDD) 411-420-2

Requiem, K626: Elly Ameling; Scherler; Devos; Soyer; Gulbenkian Chorus and Orch, Corboz cond.

Erato ECD-88 157

Requiem, K626: Concentus Musicus Vienna, Nikolaus Harnoncourt cond.

Teldec 8.42 756

Requiem: Edith Mathis; Julia Hamari; W. Ocham; Karl Ridderbusch; Hans Haselboeck, organ; Konzertvereinigung; Vienna State Opera Choir; Vienna Philharmonic Orch, Karl Boehm cond.

DG (ADD) 413 553-2

Serenade in D 'Posthorn'; two marches in D, K335, 1; K335, 2: Academy of St Martin-in-the-Fields, Neville Marriner cond.

Philips (DDD) 412 725-2

Serenade K361, 'Gran Partita': Collegium Aureum.

Harmonia Mundi 567-1 99 919-2

Serenade No 10, K361 'Gran Partita': Vienna Mozart Wind Ensemble, Nikolaus Harnoncourt cond.

Teldec 8.42 981

Serenade No 11 in E flat major, K375; and No 12 in C minor, K388: Vienna Mozart Wind Ensemble, Nikolaus Harnoncourt

Teldec 8.43 097

Serenade No 4, K203 'Colleredo': Collegium Aurem.

Harmonia Mundi 567-1 99 989-2

Serenade No 5, K204: Collegium Aureum, F. J. Maier cond.

Harmonia Mundi 567-1 99 958-2

Serenade No 9 in D major, K320 'Posthorn': Staatskapelle Dresden, Nikolaus Harnoncourt cond.

Teldec 8.43 063

Serenade No 6 in D, K239; divertimentos K138 & K287: Academy of St Martin-in-the-Fields' Chamber Ensemble.

Philips (DDD) 412 740-2

Serenade; K185; march K89: Jaap Schroder, violin; Academy of Ancient Music, Christopher Hogwood cond.

L'Oiseau-Lyre 411 936-2

Serenade; K361 'Gran Partita': Academy of St Martin-in-the-Fields; Neville Marriner cond.

Philips (DDD) 412 726-2

Serenade; K525; Eine Kleine Nachtmusik; divertimento in S, K136; A Musical Joke, K522: Academy of St Martin-in-the Fields' Chamber Ensemble.

Philips (DDD) 412 269-2

Sinfonia concertante; violin concerto No 2: Iano Brown; Josef Suk, Academy of St Martin-in-the-Fields, Neville Marriner cond.

Argo 411 613-2

Sinfonia concertante in E flat K297b; oboe concerto: Aurele Nicolet, flute; Heinz Holliger, oboe; Hermann Baumann, horn; Klaus Thuneman, bassoon; Academy of St Martin-in-the-Fields, Neville Marriner cond.

Philips (DDD) 411 134-2

Sinfonia concertante, K364; concertone K190: Norbert Brainin and Peter Schidlof, violins; English Chamber Orch, Alexander Gibson cond.

Chandos CHAN-8315

Sinfonias concertante K364; K anh 9: Lausanne Chamber Orch, Armin Jordan cond.

Erato ECD-88 113

Sonata in A minor, K310; sonata in C minor, K457: Alfred Brendel, piano.

Philips (DDD) 412 525-2

Sonatas for piano and violin; in B flat, K378; in E minor, K304; in F, K376; in G, K301; Clara Haskil, piano; Arthur Grumiaux, violin.

Philips (ADD) 412 525-2

Sonatas for violin and piano K296, 305, 306: Itzhak Perlman, violin; Daniel Barenboim, piano.

DG (DDD) 415 102-2

Sonatas for violin and piano K301-304; Itzhak Perlman, violin; Daniel Barenboim, piano.

DG (DDD) 410 896-2

Sonatas, K545, 570, 576: Paul Badura-Skoda, piano.

Astree E7704

Sinfonia concertante for violin and viola; concertone for two violins: Jean-Jacques Kantarow, violin; Netherlands Chamber Orch.

Denon C37-7507

String quartet No 17, K458 "The Hunt"; plus — string quartet No 77 in C 'Emperor' (Haydn): Amadeus Quartet.

DG (DDD) 410 866-2

String quartets in B flat major, K 498 'Hunt': Smetana Quartet.

Denon C37-7003

String quartets in D, K575; B flat, K589 'Prussian': Orlando Quartet.

Philips (DDD) 416 121-2

String quartets K387 and K575: Alban Berg Quartet.

Teldec 8.43 122

String quartets No 14 in G major, K387: No 15 in D minor: Kocian Quartet.

Denon C37-7228

String quartets No 17 'Hunt'; and No 19 'Dissonance': Alban Berg Quartet.

Teldec 8.43.055

String quartets No 22 K589; and No 23, K590 'Prussian': Alban Berg Quartet.

Teldec 8.42 042

String quartets, K387 and K590: Brandis Quartet.

Orfeo ORF C041

String quintets, K515 and K516: Denes Koromzay; Takacs Quartet.

Hungaraton HCD 12656-2

String quintets: No 3 in C major, K515; No 4 in G minor, K516. (Prize of Record Academy, Tokyo): Josef Suk, 1st viola; Smetana Quartet.

Denon C37-7014

Symphonies No 25, K183; and No 40, K550: Concertgebouw Orch, Amsterdam, Nikolaus Harnoncourt cond.

Teldec 8.42 935

Symphonies No 25, K183; and No 40, K550: Scottish Chamber Orch, James Conlon cond.

Erato ECD-88 078

Symphonies No 29 and No 35 'Haffner'; Masonic funeral music: Vienna Philharmonic Orch, Karl Boehm cond.

DG (ADD) 413 734-2

Symphonies No 31 K297 'Paris'; and No 33, K319: Concentus Musicus Vienna, Nikolaus Harnoncourt cond.

Teldec 8.42 817

Symphonies No 35 'Haffner' and No 41 'Jupiter': Vienna Philharmonic Orch, Leonard Bernstein cond.

DG (DDD) 415 305-2

Symphonies No 35 in D major, K385 'Haffner'; and No 38 in D major, K504 'Prague': Bamburg Symphony Orch, Eugen Jochum cond.

Ariola-Eurodisc 610 277-231

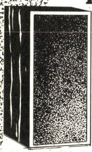
Symphonies No 38 'Prague' and No 39: Vienna Philharmonic Orch, Karl Boehm cond.

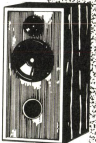
DG (ADD) 413 735-2

Symphonies No 38 in D major, K504 'Prague'; and No 39 in E flat major, K543: Staatskapelle Dresden; Herbert Blomfeld cond.

Denon C37-7146

DAVID TILBROOK DOES IT AGAIN!





vifa

We're talking about the exciting new David Tilbrook designed speaker kit which uses VIFA's high performance drivers from Denmark. His 2-way, digital-ready 100 Watt capable masterpiece. The name Tilbrook is synonymous with brilliant design and performance characteristics and this new system keeps the legend alive and well. The magazine 'The Australian Electronics Monthly' – where David is Project Manager – published full details of the design in their August issue. Already there has been considerable interest and many speakers have now been built with superb results.

You'll save around $800 when you hear what you get from this system when compared to something you buy off the shelf with similar characteristics. If you compare its performance to fully imported, high priced speakers from Mission, Heybrook, Monitor Audio, Bang & Olufsen and many others, you'll see that they too use these VIFA speakers. This kit of 2-P21WO Polycone Woofers and 2-D25TG-55 Ferrofluid Cooled dome tweeters with Polymer Diaphragms, is available for $350. Cross-overs, cabinets and loudspeaker stands are also available.

For futher information and a reprint of the full details of the Tilbrook project, please telephone or write to the Sole Australian Distributors, who can also give you the name and address of your nearest stockist.

Stocked by Jaycar Electronics and leading hi-fi and electronic stores.

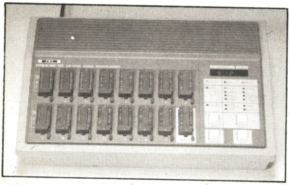
Sole Australian Distributor:
SCAN AUDIO PTY. LTD., P.O. Box 242,
Hawthorn 3122. Telephone (03) 429 2199.

Queensland Distributor:
Queensland Stereo Visual Supply.
Telephone (07) 265 7945.

PROFESSIONAL PROMAC EPROM PROGRAMMERS

NEW P15

Stocked & supported in Australia by Current Solutions (03) 836 9220



FEATURES INCLUDE

- 2716 to 27512 (EP, EEP + CMOS)
- Programs 15 ROMS Simultaneously
- RS 232 Communication
- 4K BYTE I/O Buffer
- Compact Size
- Auto AC Voltage Range 85 to 264V
- 12 Month Warranty

Phone today your state sales outlet

VICTORIA: R.A.E. (Victoria) Pty. Ltd. Ph. ☎ (03) 277 4033.
N.S.W.: R.A.E. Industrial Electronics Pty. Ltd. Ph. ☎ (02) 439 7599.
A.C.T.: Canberra Professional Equipment Pty. Ltd. Ph. ☎ (062) 80 5576.
S.A.: D.C. Electronics Pty. Ltd. Ph. ☎ (08) 223 6946.
W.A.: Kennor Holdings P/L. Ph. ☎ (09) 330 1200.
QUEENSLAND: Computer Components Pty. Ltd. Ph. ☎ (07) 44 9559.
TASMANIA: Hocking Electronics Ph. ☎ (002) 23 4388.

ECONOMIC ELECTRONICS

287 WATER ST, FORTITUDE VALLEY
PH: (07) 52 3762
SOUTHPORT ELECTRONICS SHOP
11 DAVENPORT ST, SOUTHPORT
PH: (075) 321 3622

Xcelite electronic pliers and cutters

Xcelite

For Technicians, Servicemen, and Field Engineers
Choice of three sturdy, spacious and attractive Attache Style Tool Cases to meet virtually every need.
TC-100ST
TC-200ST
TC-150ST
A selected range of Xcelite tools

CooperTools

Weller
DS600
PORTABLE DESOLDERING STATION
Fully self contained with in-built compressor

Weller

FAMOUS QUALITY SOLDERING STATION

WTCPN CONTROLLED OUTPUT

NEW

50FT ROLLS DESOLDERING BRAID

NEW LINE

PHILIPS COMPUTERGRADE ELECTROLYTICS
040 SERIES 16-100 VOLT 2200uf to 4700uf
114 SERIES 16-100 VOLT 2200uf to 47000uf

ELECTROLUBE R

QUALITY SERVICE CHEMICALS AND SPRAYS

Symphonies No 38, K504 'Prague'; and No 41, K551 'Jupiter': Concertgebouw Orch Amsterdam, Nikolaus Harnoncourt cond.
Teldec 8.43 219 (2 CDs)
Symphonies No 39 and 40: Bamberg Symphony Orch, Eugen Jochum cond.
Orfeo ORF C045901
Symphonies No 39 and No 40: Vienna Philharmonic Orch, Leonard Bernstein cond.
DG (DDD) 413 776-2
Symphonies No 40 and No 41 'Jupiter': Vienna Philharmonic Orch, Karl Boehm cond.
DG (ADD) 413 547-2
Symphonies No 40, K550: AND No 41, K551 'Jupiter': English Chamber Orch; Jeffrey Tate cond.
EMI 747147
Symphonies Nos 29 and 33 (on period instruments): English Baroque Soloists; John Eliot Gardiner cond.
Philips (DDD) 412 736-2
Symphonies Nos 39 and 41, 'Jupiter': Staatskapelle Dresden; Colin Davis cond.
Philips (DDD) 410 046-2
Symphonies No 31, 'Paris'; and No 41 'Jupiter': Scottish Chamber Orch, James Conlon cond.
Erato ECD-88 029
Symphony No 34; and No 35 'Haffner': Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.42 703
Symphony No 36, K425 'Linz'; Lucio Silla overture: Concertgebouw Orch Amsterdam, Nikolaus Harnoncourt cond.
Teldec 8.43 108
Symphony No 38 'Prague'; and No 39: Scottish Chamber Orch, James Conlon cond.
Erato ECD-88 093
Symphony No 38 in D major K504 'Prague': Symphony No 36 in C major, K 425 'Linz'; NHK Symphony Orch, Otmar Suitner cond.
Denon C37-7051
Symphony No 39, K543; and No 32, K318: Concertgebouw Orch Amsterdam, Nikolaus Harnoncourt cond.
Teldec 8.43 107
Symphony No 40 in G minor, K550; Symphony No 41 in C minor, K551 'Jupiter': Staatskapelle Dresden, Herbert Blomstedt cond.
Denon C37-7022
Symphony No 40, K550; and No 41, K551 'Jupiter: Chicago Symphony Orch, James Levine cond.
RCA RCD14413
Symphony No 40, K550; and No 41, K551 'Jupiter': Los Angeles Chamber Orch, Gerard Schwarz cond.
Delos 3012
Symphony No 34; Symphony No 41 'Jupiter': Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 411 658-2
Symphony No 38 and No 39 'Prague': Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 410 233-2
Symphony No 31; Paris; Symphony No 40: Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 410 197-2
Ten piano concertos; No 5 in D; 6 in B flat; 7 in F for 3 pianos; 8 in C; 10 in E flat for 2 pianos; 11 in F; 15 in B flat; 16 in D; 12 in C; 26 in C 'Coronation': Alfred Brendel, piano; Academy of St Martin-in-the-Fields, Marriner cond.
Philips (ADD) 412 856-2 (10 CDs)
Thamos, King of Egypt: Thomaschke; Perry; Netherland Chamber Choir; Collegium Vocal; Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.42 702
The 15 great sonatas for piano and violin: Walter Klein, piano; Arthur Grumiaux, violin.
Philips (ADD) 412 525-2
The Abduction from the Seraglio: Nikolaus Harnoncourt, cond.
Teldec 8.35 673 (3 CDs)
The best of Mozart: Academy of St Martin-in-the-Fields, Marriner cond.
Philips (DDD) 412 244-2
The four horn concertos: St Paul Chamber Ensemble; Herman Baumann; Pinchas Zukerman cond.
Philips (ADD) 412 737-2
The late symphonies No 21-41; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (ADD) 412 954-2
The Magic Flute (for wind ensembles): Munich Wind Academy.
Orfeo ORF C092
The Magic Flute—complete opera: Edith Mathis; Francisco Araiza, Jose van Dam; Karin Ott; Janet Perry; Anna Tomowa-Sintow; Gottfried Hornik; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 410 967-2 (3 CDs)
The Magic Flute—highlights: Edith Mathis; Francisco Araiza, Jose van Dam; Karin Ott; Janet Perry; Gottfried Hornik; Berlin Philharmonic Orch; Herbert von Karajan cond.
DG (DDD) 415 287-2
The Magic Flute—highlights: Vienna Philharmonic Orch, James Levine cond.
RCA RCD14621
The Magic Flute: Margaret Price; Luciana Serra; Peter Schreier; Kurt Moll; Mikael Melbye; Theo Adam; Maria Venuti; Robert Tear; Marie McLaughlin; Ann Murray; Reiner Goldberg; Hanna Schwarz; Leipzig Radio Chorus; Staatskapelle Dresden, Colin Davis cond.
Philips (DDD) 411 459-2
Three occasions (K63 and 99; serenade K100): Jean-Francois Paillard Chamber Orchestra, J-F Paillard cond.
Erato ECD-88 101
Three piano concertos; plus—piano concerto (Schroter): Murray Perahia, piano, English Chamber Orch.
CBS CD 39222
Violin concerto No 1; sinfonia concertante; Gidon Kremer, violin; Kim Kashkashian; Vienna Philharmonic Orch, Nikolaus Harnoncourt cond.
DG (DDD) 413 461-2
Violin concerto No 2—plus violin concerto in C (Haydn): Netherlands Chamber Orch; Isabelle van Keulen, violin; Antoni Ros-Marba cond.
Philips (ADD) 412 718-2
Violin concerto No 4 in D, K218: Jean-Jacques Kantarow, violin; Netherlands Chamber Orch, Leopold Harger cond.
Denon C37-7505
Violin concertos No 1 in B flat, K207; and No 2, K211: Jean-Jacques Kantarow. violin; Netherlands Chamber Orch, Leopold Harger cond.
Denon C37-7506
Violin concertos No 2 and No 4: Anne-Sophie Mutter, violin; Philharmonia Orch; Riccardo Muti cond.
EMI 747011
Violin concertos No 3 and 5: Pinchas Zukermann, violin; St Pauls Chamber Orch.
CBS CD 372902
Violin concertos No 3 and No 5: Itzhak Perlman, violin; Vienna Philharmonic Orch, James Levine cond.
DG (DDD) 410 020-2
Violin concertos No 3 and No 5: Jose Luis Garcia; violin; English Chamber Orch.
Ensayo 3405
Violin concertos No 3 in G, K216; and No 5 in A, K219 'Turkish': Jean-Jacques Kantarow, violin; Netherlands Chamber Orch, Leopold Harger cond.
Denon C37-7504
Violin concertos No 3 in G, K216; No 5 in A: Kim Sjoegren, violin; Collegium Musicum Copenhagen/Schoenwandt.
BIS BIS CD-282
Violin concertos No 4 and No 5: Oscar Shumsky, violin; Scottish Chamber orch, Tortelier cond.
Nimbus NIM 5009
Violin concertos No 3 and 5: Arthur Grumiaux, London Symphony Orch, Colin Davis, cond.
Philips (ADD) 412 250-2

MUSSORGSKY
Pictures at an Exhibition; plus Ravel: Le Tombeau de Couperin; Chicago Symphony Orch, Georg Solti cond.
Decca 400 051-2
Pictures at an Exhibition; Night on Bare Mountain; Orchestre de la Suisse Romande, Ernest Ansermet cond.
Decca 414 041-2
Boris Godounov: Alexander Verdernikov; Vladimir Matorin; Vladislav Piavko; Irina Arkhipova; Yuri Masurok; USSR large chorus; USSR TV and Radio, Large Symphony Orch, Vladimir Fedoseysev cond.
Philips (ADD) 412 281-2
Pictures at an Exhibition (instr: Ravel) plus— La Valse (Ravel): London Symphony Orch, Claudio Abbado cond.
DG (DDD) 410 033-2
Pictures at an Exhibition; six piano pieces; Jacques Rouvier, piano.
Denon C37-7177
Pictures at an Exhibition; Tomita, percussion.
RCA RCD10838
Pictures at an Exhibition, Night on Bare Mountain: Cleveland Orch, Lorin Maazel cond.
Telarc 80042
Pictures at an Exhibition; Night On Bare Mountain: St Louis Symphony Orch, Leonard Slatkin cond.
MMG MCD 10014
Pictures at an Exhibition; Night on Bare Mountain; Concertgebouw Orch Amsterdam, Colin Davis cond.
Philips (DDD) 411 473-2
Pictures at an Exhibition; plus—Firebird suite (Stravinsky): Philadelphia Orch, Riccardo Muti cond.
EMI 747099
Pictures at an Exhibiton; plus—La Valse (Ravel); New York Philharmonic Orch, Zubin Mehta cond.
CBS CD 76880

MYSLIVECEK
Violin concertos No 1 and No 2; Ishikawa, violin; Dvorak Chamber Orch, Pesek cond.
Supraphon SUP CD7429

NAZARETH, Ernesto
Brazilian tangoes and waltzes: Arthur Moreira —Lima, piano.
Pro Arte PA-CDD 144

NIELSEN
Symphony No 2; Aladin; suite for orch: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-247
Symphony No 4 'Inextinguishable': Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 413 313-2

OFFENBACH
Gaite Parisienne (complete ballet): Arr M. Rosenthal; Pittsburgh Symphony Orch, Andre Previn cond.
Philips (DDD) 411 039-2
Gaite Parisienne; plus-Gounod: Faust ballet: Orchestre Symphonique de Montreal, Charles Dutoit cond.
Decca (DH) 411 708-2
Overtures: La Belle Helene; Orpheus in the Underworld; La Grande-Duchesse de Gerolstein; etc; Philharmonia Orch, Neville Marriner cond.
Philips (DDD) 411 476-2
Overtures: Orpheus in the Underworld; La Belle Helene; Bluebeard; Grande-Duchesse de Gerolstein; etc; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 400 044-2

ORFF
Carmina Burana—complete opera: Lucia Popp, Hermann Prey; van Kesteren; Toelz Boys Choir; Munich Radio Chorus and Orch, Eichhorn cond.
Ariola-Eurodisc 610 085-231
Carmina Burana—original version; Clemencic Consort.
Harmonia Mundi HM 90.0335
Carmina Burana: Greenberg; Bowman; Roberts, Radio Symph Orch Berlin and choir, Ricardo Chailly, cond.
Decca (DH) 411 702-2
Carmina Burana: Atlanta Symphony Orch, Robert Shaw cond.
Telarc 80056
Carmina Burana: Southend Boys' Choir; Phil Chorus and Orch, R. Muti cond.
EMi 747100

PACHELBEL
Canon and Gigue in D major; plus—suite No 2, BWV1067 (Bach); sonata Op 5, No 4 (Handel); trio-sonata 'La Follia' (Vivaldi): Musica Antiqua Cologne
Archiv (DDD) 410 502-2
Canon and other Baroque Favourites: Toronto Chamber Orch, Neel cond.
MMG MCD 10012
Canon; plus—Handel; Vivaldi, Gluck, etc; Academy of Ancient Music, Christopher Hogwood cond.
L'Oiseau-Lyre 410 553-2
Canon; plus—Albinoni, Bach, Boccherini, etc; Stuttgarter Kammerorchester, Karl Munchinger cond.
Decca (DH) 411 160-2

PAERT
Tabula Rasa.
ECM 817 765-2

PAGANINI
24 Cappricci, Op 1: Shlomo Mintz. violin.
DG (DDD) 415 043-2
24 caprices; Itzhak Perlman, violin.

EMI 747171
Sonata for guitar in F major; plus— Guiliani; Legnani; Diabelli; Eduardo Fernandez, guitar.
Decca (DH) 414 160-2
Violin concerto No 1; plus—Carmen fantasy (Barabate): Itzhak Perlman, violin; Royal Phil Orch, Lawrence Foster cond.
EMI 747101

PALESTRINA
Mass and Motet; Tu es Petrus; plus — Victoria: Mass and Motet: O Quam Gloriosum: Choir of King's College, Cambridge, Stephen Cleobury cond.
Argo 410 149-2

PERGOLESI
6 Concerti Armonici: Academy of St Martin-in-the-Fields, Neville Marriner cond.
Argo 410 205-2
Stabat Mater: Magda Kalmar; Julia Hamari; Lamberto Gardelli.
Hungaraton.
HCD 12201-2
Stabat Mater: Margaret Marshall; Lucia Valentini Terrini; London Symphony Orch, Claudio Abbado cond.
DG (DDD) 415 103-2

PONCHIELLI
La Gioconda: Caballe; Pavarotti; Baltsa; Milnes; Ghiaurov; National Philarmonia Orch, Bruno Bartoletti cond.
Decca 414 349-2 (3CDs)

POULENC
Chamber music for wind instruments: Robison; de Peyer; Wadsworth; Arner.
Erato ECD-88 044
Concerto for two pianos; etc. F. R. Duchable and J. P. Collard, pianos; Roterdam Phil Orch, James Conlon cond.
Erato ECD-88 140
Le Voix Humaine: Carole Farley, soprano; Adelaide Symphony Orch, Jose Serebrier cond.
Chandos CHAN-8331
Organ concerto; Concerto Champetre for harpsichord and orch: Marie-Claire Alain, organ; Ton Koopman, harpsichord; Rotterdam Phil Orch, Conlon cond.
Erato ECD-88 141
Organ works: Michael Murray, organ.
Telarc 80104
Stabat Mater: Orch National de Lyon, Baudo cond.
Harmonia Mundi HM 90.5149

PRAETORIUS
Early 17th century dances — a Renaissance Revel: Calliope.
WEA 79039-2

PROKOFIEV
Alexander Nevesy: Irina Arkhipova, Cleveland Orch and Chorus, Riccardo Chailly, cond.
Decca (DH) 410 164-2
Alexander Nevsky, Op 78; Song of Joy, Op 85: USSR Symphony Orch and Choir, Gennady Rozhdestvensky cond.
Chant du Monde LDC 278.389
Cello sonata; plus — cello sonata (Shostakovich): Yuli Turovsky, cello; Luba Edlina, piano.
Chandos CHAN-8340
Cinderella: St Louis Symphony Orch, Leonard Slatkin cond.
RCA RCD15321
Ivan the Terrible: Festival de Sofia 1984.
Forlane UCD-16 530
Love of Three Oranges; Lieut Kije suite: Dallas Symphony Orch, Eduardo Mata cond.
RCA RCD15168
Piano concerto No 3; plus — Bartok: Piano concerto No 3: Vladimir Ashkenazy, piano; London Symphony Orch, Andre Previn cond.
Decca 411 969-2
Piano concerto No 3; plus — piano concerto No 1 (Tchaikovsky): Martha Argerich, piano; Berlin Philharmonic Orch, Claudio Abbado cond.
DG (DDD) 415 062-2
Piano concerto No 5, Op 55; plus — piano concerto No 2 (Rachmaninov): Sviatoslav Richter, piano; Warsaw Philharmonic Orch, Witold Rowicki cond.
DG (ADD) 415 119-2.
Piano sonata No 6; plus — Gaspard de la Nuit (Ravel): Ivo Pogorelich, piano.
DG (DDD) 413 363-2
Romeo and Juliet — suites 1 and 2 excerpts: Cleveland Orch, Yoei Levi cond.
Telarc 80089
Romeo and Juliet — Suite; Symphony No 1 'Classical': Chicago Symphony Orch, Georg Solti, cond.
Decca 410 200-2
Romeo and Juliet suits No 1 and No 2: National Symphony Orch of Washington, Mstislav Rostropovich cond.
DG (DDD) 410 519-2
Romeo and Juliet: Riccardo Muti.
EMI 747004
String quartets No 1 in B minor; and No 2 in F major: Sequoia String Quartet.
WEA 79048-2
Symphonie Classique; plus — Eine Kleine Nachtmusik (Mozart); Holberg suite (Grieg): Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 400 034-2
Symphony No 2; Romeo and Juliet suite No 1: Scottish National Orch, Neeme Jarvi cond.
Chandos CHAN-8368
Symphony No 5 in B flat: Israel Philharmonic, Leonard Bernstein cond.
CBS CD35877
Symphony No 5: St Louis Symphony Orch, Leonard Slatkin cond.
RCA RCD15035
Symphony No 6; three waltzes: Scottish National Orch; Neeme Jarvi cond.
Chandos CHAN-8359
Violin and piano sonatas No 1 and 2: Lydia Mordkovich, violin; G. Oppitz, piano.
Chandos CHAN-8398
Violin concertos No 1 and No 2: Itzhak Perlman, violin; BBC Symphony Orch, Gennady Rozhdestvensky cond.
EMI 747025
Violin concertos No 1 and No 2: Shlomo Mintz, violin; Chicago Symphony Orch, Claudio Abbado cond.
DG (DDD) 410 524-2
Peter and the Wolf: Boston Pops; John Williams; narrated by Terry Wogan.
Philips (DDD) 411 559-2

PUCCINI
Gianni Schicchi: Melis; Ferencsik;
Hungaraton HCD 12541-2
Madame Butterfly — complete opera: Kinces; Patane.
Hungaraton HCD 1256-57-2 (2 CDs)
Manon Lescaut — complete opera: Mirella Freni; Placido Domingo; Renato Bruson; chorus of Royal Opera House, Covent Garden; Philharmonia Orch, Giuseppe Sinopoli cond.
DG (DDD) 413 893-2 (2 CDs)
Messa di Gloria: Jose Carreras; Hermann Prey; Ambrosian Singers; Philharmonia Orch, Claudio Scimone cond.
Erato ECD-88 022
Preludio Sinfinico: Capriccio Sinfonico; Preludes: Le Villi; Edgar; Manon Lescaut: Crisantemi Radio Symph Orch Berlin; Riccardo Chailly, cond. Irina Arkhipova, Cleveland Orchestra and Chorus, Riccardo Chailly, cond.
Decca 410 007-2
Suor Angelica: Ilona Tokody; Lamberto Gardelli;
Hungaraton HCD 12490-2
Tosca — complete opera: Katia Ricciarelli; Jose Carreras; Ruggero Raimondi; chorus of the German Opera, Berlin; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (ADD) 413 815-2 (2 CDs)
Tosca — complete: Maria Callas; Giuseppe di Stefano; Tito Gobbi;
EMI 747175
Turandot — complete opera: Katia Ricciarelli; Placido Domingo; Barbara Hendricks; Ruggero Raimondi; Vienna State Opera choir; Vienna Boys' Choir; Vienna Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 410 096-2 (3 CDs)
Turandot: Sutherland; Pavarotti; Cabelle; Ghiaurov, London Symphony Orchestra, Riccardo Chailly, cond.
Decca 414 274-2 (2CDs)
La Boheme: Katia Ricciarelli; Ashley Putnam; Jose Carreras; Chorus and Orch of the Royal Opera House, Covent Garden.
Philips (ADD) 412 885-2

PURCELL
'Hail! Bright Cecilia': soloists; Monteverdi Choir; English Baroque Orch, John Eliot Gardiner, cond.
Erato ECD-88 046
'Tis Nature's Voice — songs and elegies: Jacobs; Junghanel; W. Kuijken.
Accent ACC 57802
Dido and Aeneas: Emma Kirby; Taverner Choir and Players, Andrew Parrott, cond.
Chandos CHAN-8306
Dido and Aeneas: A. Murray; P. Yakar; Schoenberg Choir; Concentus Musicus Vienna, Nikolaus Harnoncourt cond.
Teldec 8.42 919
King Arthur — highlights: Alfred Deller, counter-tenor.
Harmonia Mundi HM 90.0252
King Arthur: Jennifer Smith; F. Fisher; Friday; Elliott; Varcoe; Monteverdi Choir; English Baroque Soloists, John Eliot Gardiner cond.
Erato ECD-88 056 (2CDs)
Music for a While; O Solitude: Alfred Deller, counter-tenor.
Harmonia Mundi HM 90.0249
Music for Queen Mary: soloists; Monteverdi Choir and Orch, John Eliot Gardiner cond.
Erato ECD-88 071
Songs: Andrew Dalton, alto.
Etcetera KTC 1013

RACHMANINOV
Piano concertos No 1 & 2: Zoltan Kocsis; San Fransisco Symphony Orch, Edo de Waart cond.
Philips (ADD) 412 881-2
24 preludes — Sonata No 2: Vladimir Ashkenazy, piano.
Decca 414 417-2 (2 CDs)
Concerto No 2 in C minor: Arthur Rubinstein, piano; Chicago Symphony Orch, Fritz Reiner cond.
RCA RCD14934
Elegiac piano trios. Borodin Trio.
Chandos CHAN-8341
Golden Jubilee Concert: Concerto No 3 in D minor; Vladmir Horowitz, piano; New York Philharmonic Orch, Eugene Ormandy cond.
RCA RCD12633
Isle of the Dead; Symphonic Dances: Concertgebouw Orch, Vladimir Ashkenazy cond.
Decca 410 124-2
DG (ADD) 415 119-2
Piano concerto No 2; plus — piano concerto No 5 (Prokofiev): Sviatoslav Richter, piano; Warsaw Symphony Orch, Stanislow Wislocki cond.
DG (ADD) 415 119-2
Piano concerto No 2: Cecile Licad, piano; Chicago Symphony Orch, Claudio Abbado cond.
CBS CD 38672
Piano concerto No 3: Dimitris Sgouras, piano; Berlin Philharmonic Orch, Yuri Simonov cond.
EMI 747031
Piano concertos Nos 3 & 4: Zoltan Kocsis; San Fransisco Symphony Orch, Edo de Waart cond.
Philips (DDD) 411 475-2
Rhapsody on a theme by Paganini; plus — piano concerto No 2 (Saint-Saens): Bella Davidovich, piano; Concertgebouw Orch Amsterdam, Neeme Jarvi cond.
Philips (DDD) 410 052-2
Suite No 2 Op. 17; plus — La Valse, Ravel; Variations on a theme by Paganini, Lutoslawski: Martha Argerich and Nelson Freire, piano.
Philips (DDD) 411 034-2
Symphonic dances, Op 45 1-3; Vocalise, Op 34, No 14; 'Aleko' intermezzo: Berlin Philharmonic Orch, Lorin Maazel cond.
DG (DDD) 410 894-2
Symphonic dances, Op 45: Moscow Radio Symphony Orch, Fedosejev cond.
Ariola-Eurodisc 880 012-231
Symphony No 2 in E minor, Op 27: London Symphony Orch, Andre Previn cond.
EMI 747159
Symphony No 2: Royal Phil Orch.
Telarc 80113
Symphony No 2: Los Angeles Philharmonic Orch, Simon Rattle cond.
EMI 747062
Symphony No 1: Concertgebouw Orch, Vladimir Askenazy, cond.
Decca 411 657
Symphony No 2: Concertgebouw Orch, Vladimir Ashkenazy cond.
Decca 400 081-2
Symphony No 3: Youth Symphony: Concertgebouw Orch, Vladimir Ashkenazy cond.
Decca 410 231-2
Vespers, Op 37 — complete: USSR National Choir, Svechnikoz.
Chant du Monde LDC 278.552

RAMEAU
Anacreon: Les Arts Florissants, Christie.
Harmonia Mundi HM 90.1090
Dardanus — orchestral suite: English Chamber Orch, John Eliot Gardiner cond.
Erato ECD-88 013
Harpsichord works of 1724: William

Christie, harpsichord.
Harmonia Mundi HM 90.1120
Les Indes Galantes suite: Chapelle Royale Orch, Herrewghe cond.
Harmonia Mundi HM 90.1130
The Great Motets: La Chapelle Royale Choir and Orch, Herreweghe cond.
Harmonia Mundi HM 90.1078

RAVEL
Bolero; Alborada de Gracioso, Rapsodie Espagnole; La Valse: Orch Symphonique de Montreal, Charles Dutoit cond.
Decca 410 010-2
Bolero; Alborada de Gracioso; Rapsodie Espagnole; Valses nobles et sentimentales; La Valse: Orch de la Suisse Romande, Earnest Ansermet cond.
Decca 414 046-2
Bolero; Alborado del Gracioso; Rapsodie Espagnole; etc: Dallas Symphony Orch, Edvardo Mata cond.
RCA RCD 14438
Bolero; Alborado; La Valse: Orch Nat de France, Lorin Maazel cond.
CBS CD 37289
Bolero; Daphnis and Chloe: St Louis Symphony Orch, Leonard Slatkin cond.
Telarc 80052
Bolero; etc: London Symphony Orch, Morton Gould cond.
Varese Sarabande 47209
Bolero; etc: London Symphony Orch, Andre Previn cond.
EMI 747162
Bolero; Valse, Alborada del Gracioso; Mother Goose: Suisse Romande Orch, Armin Jordan cond.
Erato ECD-88 159
Bolero; La Valse; Pavane pour un Infante Defunte; Daphnis et Chloe: Orchestre de Paris, Daniel Barenboim, cond.
DG (DDD) 400 061-2
Daphnis et Chloe: London Symphony Orch, Andre Previn cond.
EMI 747123
Daphnis et Chloe: Orch Symphonique de Montreal, Charles Dutoit cond.
Decca 410 255-2
Gaspard de la Nuit; Pavane pour une infante defunte; Valses nobles et sentimentales: Vladimir Ashkenazy, piano.
Decca 410 255-2
Gaspard de la Nuit; plus — sonata No 6 (Prokofiev): Ivo Pogorelich, piano.
DG (DDD) 413 363-2
L'Enfant et Les Sortileges: Ambrosian Singers; London Symphony Orch, Andre Previn cond.
EMI 747169
Lieder: Dietrich Fischer-Dieskau, baritone
Orfeo ORF C061
Ma Mere L'Oye — complete; Valse nobles et sentimentales; La Valse: Dallas Symphony Orch, Eduardo Mata cond.
RCA RCD14815
Ma Mere L'Oye; Parvane une infante defunte; Le Tombeau de Couperin; Valse nobles et sentimentales: Orch Symphonique de Montreal, Charles Dutoit cond.
Decca 410 254-2
Ma Mere L'Oye; plus — Carnaval des Animaux (Saint-Saens): Joseph Villa; Patricia Prattis Jennings; Anne Martindale Williams; Pittsburg Symphony Orch, Andre Previn cond.
Philips (DDD) 400 016-2
Miroirs; Le Tombeau du Couperin: Yukie Nagai, piano.
BIS BIS CD-246
Piano concerto in G; concerto for the left hand: Abdel Rahman El Bacha, piano; Loire Phil Orch; Soustrot cond.
Forlane UCD-16 522
Piano music: Dezso Ranki, piano.
Hungaraton HCD 12317-2
Piano trio; plus-piano trio in G minor, Op. 3, Chausson: Beaux Arts Trio.
Philips (DDD) 411 141-2
Piano works Vol 2 — Tombeau du Couperin; Sonatine; etc: Vlado Perlemuter, piano.
Numbus NIM 5011
Piano works: Vlado Perlemuter, cond.
Nimbus NIM 5005
Pictures at an Exhibition (Mussorgsky/Ravel); Tombeau du Couperin; Forlane; Menuet; Rigaudon: Dallas Symphony Orch, Eduardo Mata cond.
RCA RCD14573
Quartet; plus — quartet No 3 (Bartok): Sequoia String Quartet.
Delos 3004
Seven songs: Kiri Te Kanawa, soprano;
EMI 747111
Sheherazade; plus — Nuits d'Ete (Berlioz): Hildegard Behrens, Wiener Symphoniker, Francis Travis cond.
Decca 411 895-2
Sheherazade; plus — Nuits de'Ete (Berlioz): Jessye Norman; London Symphony Orch, Colin Davis cond.
Philips (DDD) 412 493-2
String quartet; plus — string quartet (Debussy): Orlando quartet.
Philips (DDD) 411 050-2
The piano concertos: Menuet antigue; Une barque sur l'ocean: Pascal Roge, Orch Symphonique de Montreal; Charles Dutoit cond.
Decca 410 230-2

RESPIGHI
Church Windows; Brazilian Impressions: Philharmonia Orch, Geoffrey Simon cond.
Chandos CHAN-8317
Pines of Rome; Birds; Fountains of Rome: Atlanta Symphony Orch.
Telarc 80085
Pines of Rome; Fountains of Rome; Feste Romane: Orch Symphonique de Montreal, Chalres Dutoit cond.
Decca 410 145-2
Pines of Rome; The Birds; Fountains of Rome: San Fransisco Symphony Orch, Edo de Waart cond.
Philips (DDD) 411 419-2
La Fiamma — complete: Tokody; Takacs; Kelen; Solyom-Nagy; Gardelli;
Hungaraton HCD 12591-93-2 (3 CDs)
Pines of Rome; Fountains of Rome; Ancient Airs and Dances, suite No 3: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (ADD) 413 822-2

REUBKE, Julius
Organ sonata 'The 94th Psalm'; plus — fantasia and fugue on 'Ad Nos' (Liszt): Simon Preston, organ.
DG (DDD) 415 139-2

RIMSKY-KORSAKOV
Capriccio Espagnol; May Night, overture; Sadko; The Snow Maiden: Roberta Alexander; women's voices of the Philharmonic Toonkunst choir, Rotterdam; Rotterdam Philharmonic Orch, David Zinman cond.
Philips (DDD) 411 446-2
Sheherazade; Capriccio Espagnol: Orch Symph de Montreal, Dutoit cond.
Decca 410-253-2
Sheherazade; plus — Borodi: Polovtsian Dances: Orch de la Suisse Romande, Ernest Ansermet cond.
Decca 414 124-2
Sheherazade: USSR Radio Symphony Orch, Fedosejev cond.
Ariola-Eurodisc 880 010-231
Sheherazade: Philadelphia Orch, Riccardo Muti cond.
EMI 747023
Sheherazade: London Symphony Orchestra.
Varese Sarabande 47208
Sheherazade: Herman Krebbers; Concertgebouw Orch Amsterdam, Kirill Kondrashin cond.
Philips (AAD) 400 021-2
Sheherazade: Vienna Philharmonic Orch, Andre Previn cond.
Philips (DDD) 411 479-2
Suites: Snow Maiden; Christmas Eve; Le Coq d'Or; Flight of the Bumble Bee; etc: Scottish National Orch, Neeme Jarvi cond.
Chandos CHAN-8327/8/9 (3 CDs)
Tale of Tsar Saltan; Golden Cockerel: Rotterdam Phil Orch, David Zinman.
Philips (DDD) 411 435-2

RODRIGO
Aranjuez concerto; Fantasia para un Gentilhomme; plus — concertino (Bacarisse): Narciso Yepes, guitar.
Forlane UCD-10 901
Concerto de Aranjuez: John Williams, guitar; Philharmonia Orch, Louis Fremaux cond.
CBS CD 37848
Concierto Madrigal; Concierto Andaluz: Pepe Romero; Los Romeros; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (AAD) 400 024-2
Concierto para una Fiesta; plus — Concierto de Malaga (Moreno/Torroba): Pepe Romero, guitar; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 411 133-2
Concierto de Aranjuez; Concierto Andaluz: Pepe Romero; Angel Romero, Celedonio Romero; Celin Romero; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (ADD) 411 440-2
Guitar concertos:
Varese Sarabande 47219
Concierto de Aranjuez; Fantasia para un Gentilhombre: Charles Bonell; Orch Symphonique de Montreal, Charles Dutoit cond.
Decca 400 054-2

ROSSINI
7 overtures, Vol 1; William Tell; La Gazza ladra; La Scala di seta, etc: National Philharmonic Orch, Riccardo Chailly cond.
Decca 414 407-2
Famous overtures — William Tell; The Barber of Seville; The Thieving Magpie; Cinderella; The Silken Ladder; Otello; The Italian Girl in Algiers; Semiramide: Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (ADD) 412 893-2
Il Barbiere de Siviglia — complete: Thomas Allen; Agnes Baltsa; Francisco Araiza; Domenico Trimarchi; Ambrosian Opera Chorus; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 411 058-2 (3CDs)
Il Barbiere de Siviglia; (highlights from the above recording): Thomas Allen; Agnes Baltsa; Francisco Araiza; Domenico Trimarchi; Ambrosian Opera Chous; Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 412 266-2
Il Viaggio a Reims — complete opera: Katia Ricciarelli; Lucia Valentini Terrani; Francisco Araiza; Ruggero Raimondi; Prague Philharmonic Chorus; Chamber Orch of Europe; Claudio Abbado cond.
DG (DDD) 415 498-2 (2CDs)
Maometto II — complete: Margarita Zimmerman; June Anderson; Samuel Ramey; Ernesto Paliacio; Lawrence Dale; Ambrosian Opera Chorus; Philharmonia Orch, Claudio Scimone cond.
Philips (DDD) 412 148-2 (3CDs)
Overtures: Philadelphia Orch, Riccardo Muti cond.
EMI 747118
Petite Masse Solenelle: Jose Carreras; Katia Ricciarelli; Samuel Ramey; Margarita Zimmerman; Craig Sheppard, piano; Ambrosian Singers, Claudio Scimone cond.
Philips (DDD) 412 548-2 (2CDs)
Petite Masse Solenelle: Lovaas; Faessbinder; Schreier; Fischer-Dieskau; Munich Vocalists, Wolfgang Sawallisch, cond.
Ariola-Eurodisc 610 263-232 (2 CDs)
Sonatas for strings, Nos 1, 3, 4, 5: Camerata Bern.
DG (DDD) 413 310-2
Sonatas for strings: Franz Liszt Chamber Orch, Budapest.
Teldec 8.43 109
Stabat Mater: Katia Ricciarelli; Lucia Ventini Terrani; Dalmacio Gonzalez; Ruggero Raimondi; Philharmonia Orch and Chorus, Carlo Maria Giulini cond.
DG (DDD) 410 034-2

ROSSINI/RESPIGHI
Boutique Fantasque; Der Zauberladen; plus — Britten: Soirees Musicales: National Philharmonic Orch, Richard Bonynge cond.
Decca 410 139-2

ROUSSEL
Bacchus and Ariane; Symphony No 3: Orch de Bordeaux-Aquitaine, R. Benzi cond.
Forlane UCD-16 529

RUBBRA
Symphony No 10; ect: Bournemouth Sinfonietta, H.H. Schonseler cond.
Chandos CHAN-8378

SAINT-SAENS
Cello concerto No. 1; plus — cello concerto (Schumann): Lynn Harrell, cello; Cleveland Orch, Neville Marrier cond.
Decca 410 019-2
Cello concerto No. 2; plus — cello concerto (Lalo); Elegie (Faure): RSO Berlin, Riccardo Chailly cond.
Decca 414 387-2
Cello concerto; plus — cello concerto (Lalo): Yo-Yo Ma, cello; Orch Nat de France, Lorin Maazel cond.
CBS CD 35848
Le Carnaval des Animaux; plus — Ma Mere L'Oye (Ravel): Joseph Villa,

at the leading edge

100 MBYTE OPTICAL DISK DRIVE MAKES AUSTRALIAN DEBUT
US manufacturer, **ISI**, has commenced shipments of its model **525 IBM-PC** compatible **Write-Once/Read-Mostly** drive. Supplied as a **user installable kit,** the 525 is designed as a rapid access **(100 msec)** archiving and distribution medium for backing up hard disk drives as well as an Online Direct-Access storage for local and distributed databases. The removable cartridge will withstand electromagnetic fields, heat, light and even scratching offering a data integrity exceeding that of the Winchester drive it is designed to back up.

SOFTWARE BACKUP UTILITY ELIMINATES NEED FOR TAPE DRIVES
FASTBACK can back up a full **10 MByte** hard disk on 5.25″ floppies in less than 8 minutes on an IBM-PC, XT or compatibles or **20 MByte** in the same time on an **IBM-AT.**
FASTBACK can make either partial or incremental backups or restores with full disk management, sequencing, dating and overwrite protection.

PRIAM RELAUNCHES ITS 14 inch DRIVE SERIES
Following an upsurge in demand for their **6650–10** Winchesters, with **SMART, SMD** or **Priam** interface, predictions indicate a record year for the line. Users are citing years of reliable service for the pioneer design a feat some users are claiming is not matched by more recent introductions. Daneva is preparing to restock the old trouper and would like to hear from Australian vendors needing support.

PRIAM CLUSTER TOWER SERVES UP TO 8 IBM PC COMPATIBLES
Designed as a starter for those nearly at the stage of purchasing a local area network, but confused by the array of options, the **Cluster Tower** provides immediate shared storage up to **292 MByte** and dual, concurrent **printer support.** At the same time it is designed to suit any **DOS compatible LAN** purchased in the future.

IBM-PC XT is the registered trade mark of International Business Machines.

daneva

daneva australia pty ltd

66 Bay Rd. Sandringham, Vic. 3191
P.O. Box 114, Sandringham, Vic. 3191
Telephone: 598-5622 Telex: AA34439

Suite 28, 47 Falcon Street
Crows Nest, NSW 2065
Telephone: 957-2464 Telex: AA20801

Distributors
Adelaide: DC Electronics (08) 223-6946
Brisbane: Baltec (07) 369-5900

DAN004

Patricia Prattis Jennings; Anne Martindale Williams; Pittsburgh Symphony Orch, Andre Previn cond.
Philips (DDD) 400 016-2
Organ symphony No 3: Pierre Cochereau, organ; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 400 063-2
Piano concerto No 2; plus—Rhapsody on a Theme by Paganini (Rachmaninov): Bella Davidovich; Concertgebouw Orch Amsterdam, Neeme Jarvi cond.
Philips (DDD) 410 052-2
Piano concertos No 2 and No 4: Francois-Rene Duchable, piano; Strasburg Philharmonic Orch, Alain Lombard cond.
Erato ECD-88 002
Symphony No 3 'Organ': Philadelphia Orch, Eugene Ormandy cond.
Telarc 80051
Symphony No 3 in C minor, Op 78: London Phil Orch, Enrique Batiz cond.
ASV DCA 524
Symphony No 3 with organ; Hobart, organ; Loire Phil Orch, Soustrot cond.
Forlane UCD-16 520
Symphony No 3 Organ; plus Toccata (Widor): Jean Guillon, organ; San Francisco Symphony Orch, Edo de Waart cond.
Philips (DDD) 412 619-2
Symphony No 3 organ: Orch Symphonique de Montreal, Peter Hurford cond.
Decca 410 201-2
Violin concerto No 3; plus—violin concerto No 2 (Wieniawski): Itzhak Perlman; Orchestre de Paris, Daniel Barenboim cond.
DG (DDD) 410 526-2
Violin concerto No 1; plus—Symphonie Espagnole (Lalo): Kyung Wha Chung; Orch Symphonique de Montreal, Charles Dutoit cond.
Decca 411 952-2
Violin concerto; plus—violin concerto (Mendelssohn): Cho-Liang Lin, violin, Philharmonia Orch, M. Tilson-Thomas cond.
CBS CD 39007

SALIERI

Piano concertos: Aldo Ciccolini, piano; I Solisti Veneti, Claudio Scimone cond.
Sound 3415

SATIE

Yuji Takahashi; Alain Planes, piano.
Denon C37-7487
3 Gymnopedies; 6 Gnossienes, etc: Pascal Roge.
Decca 410 220-2
Gnossiennes; Danses gothiques; Prelude de la porte heroique du ciel; Petite ouverture a danser: Reinbert de Leeuw, piano.
Philips (ADD) 412 243-2
Gymnopedies; sarabandes; waltzes; etc; Laurence Allix, piano.
Ensayo 3402
Piano music—Gymnopedies; nocturnes; gnossiennes: France Clidat, piano.
Forlane UCD-10 514
Piano music for four hands: Jordans and van Doeslaar, pianos.
Etcetera KTC 1015
Pieces Pour Piano; Yuji Takahashi, piano.
Denon C37-7485

SCARLATTI

Concerti grossi Nos 1-6: I Musici.
Philips (DDD) 400 017-2
Fourteen sonatas for harpsichord—K337, 338, 191, 522, 533, 234, 203, 477, 534, 535, 418, 419, 546, 547: Huguette Dreyfus, harpsichord.
Denon C37-7095

SCHOENBERG

Gurre—Lieder: James McCracken; Jessye Norman; Tatiana Troyanos; David Arnold; Kim Scown; Werner Klemperer; Tanglewood Festival Chorus; Boston Symphony Orch, Seiji Ozawa cond.
Philips (ADD) 412 511-2 (2 CDs)
Moses and Aron: Mazura; Langridge, Chicago Symphony Orch and Chorus, Georg Solti cond.
Decca 414 264-2 (2 CDs)
Transfigured Night, Op 4; variations for orchestra, Op 31: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (ADD) 415 326-2
Transfigured Night; plus—Seigfried Idyll (Wagner): English Chamber Orch, Vladimir Ashkenazy cond.
Decca 410 111-2

SCHUBERT

Cello concerto; plus—Saint Saens: Cello concerto, No 1: Lynn Harrell, cello; Cleveland Orch, Neville Marriner cond.
Decca 410 019-2
Die Schoene Muellerin: Dietrich Fischer-Dieskau, baritone.
EMI 747173
Die Schoene Muellerin: Francisco Araiza; Irwin Gage.
DG (DDD) 415 347-2
Die Schoene Muellerin: Dietrich Fischer-Dieskau, baritone; Gerald Moore, piano.
DG (ADD) 415 186-2
Fair Maid of the Mill: Shura Gehrman, bass.
Nimbus NIM 5024
Galway Plays Schubert: arpeggione sonata; etc: James Galway, flute.
RCA RCD15303
Impromptu D. 8999 and D. 935: Alfred Brendel, piano.
Philips (ADD) 411 040-2
Impromptu, Op 90 and Op 142: Murray Perahia, piano.
CBS CD 37291
Impromptus: Radu Lupu, piano.
Decca 411 711-2
Lieder: An die Musik; Schwestergruss; Sei mir gegrubt; Die Blumensprache; An den Mond; etc: Elly Ameling; Dalton Baldwin.
Philips (DDD) 410 037-2
Lieder: Die Allmacht; Rastlos Liebe Meeresstille; Ganymed; Erlkonig; etc: Jessye Norman, soprano; Phillip Moll, piano.
Philips (DDD) 412 623-2
Lieder: Dietrich Fischer—Dieskau, baritone; Alfred Brendel, piano.
Philips (DDD) 411 121-2
Lieder: Elly Ameling, soprano.
Etcetera KTC 1009
Moments Musicaux, Op 94 D780, No 1, 3 and 6; impromptus, D899; plus—fantasy pieces (Schumann): Sviatoslav Richter, piano.
Ariola-Eurodisc 880 016-231
Octet in F major for strings, D803: Boston Symphony Chamber Players.
WEA 79046-2
Piano sonata in C: Sviatoslav Richter, piano.
Philips (DDD) 416 292-2
Piano sonata, D537; plus—four ballades (Brahms) Arturo Benedetti Michelangeli, piano.
DG (DDD) 400 043-2
Piano sonatas No 13, D664, and No 14, D784: Sviatoslav Richter, piano.
Ariola-Eurodisc 880 011-231
Piano sonatas No 13, D664, and No 14, D784: Sviatoslav Richter, piano.
MMG MCD 10030
Piano sonata No 9, D575, and No 11, D625: Sviatoslav Richter, piano.
Ariola-Eurodisc 880 013-231
Piano trio No 1, Op 99: Borodin Trio.
Chandos CHAN-8308
Piano trio, Op 100 No 2: Borodin Trio.
Chandos CHAN-8324
Piano trio, Op 100: Les Musiciens.
Harmonia Mundi HM 90.1047
Piano trios: in B flat Op 99; in E flat Op 100; trio in one movement in B flat; sonata; adagio in E flat; notturno: Beaux Arts Trio.
Philips (DDD) 412 620-2 (2 CDs)
Quintet in A major for piano and strings, D667 'Trout'; string quartet No 12 in C minor, D703 'Quartettsatz': Smetana Quartet; Josef Hala, piano; Fantisek Posta, double-bass.
Denon C37-7239
Quintet in A major, D667 'The Trout': Alfred Brendel; James van Demark; members of the Cleveland Quartet.
Philips (AAD) 400 078-2
Quintet in A major, D667 'Trout'; string quartet No 12 in C minor, D703 'Quartettsatz': Emil Gilels, piano; Amadeus Quartet.
DG (ADD) 413 453-2
Piano quintet in A major, D667 'Trout': Sviatoslav Richter, piano; Borodin Quartet. EMI 747007
Quintet in A major, D667 'Trout': Andras Schiff, piano; Hagen Quartet, Alois Prosch cond.
Decca 411 957-2
Quintet in C major: Yo-Yo Ma, cello; Cleveland Quartet.
CBS CD 39134
Quintet in A major for piano and strings, D667 'Trout': Arad; Streicher; Haydn Trio.
Teldec 8.42 695
Ranki Plays Schubert: Dezso Ranki, piano.
Denon C37-7488
Rosamunde, D.797: Elly Ameling; Leipzig Radio Chorus; Gewandhaus Orchestra, Leipzig; Kurt Masur cond.
Philips (DDD) 412 432-2
Schwanengesang. Dietrich Fischer-Dieskau; Alfred Brendel.
Philips (DDD) 411 051-2
Schwangesang; 7 lieder: Dietrich Fischer-Dieskau, baritone; Gerald Moore, piano.
DG (ADD) 415 188-2
Shepherd on the Rock — selected lieder: Margaret Price.
Orfeo ORF C001
Sonata for arpeggione and piano in A minor D.821; plus—fantasiestucke Op 73 and Stucke im Volskton (Schubert): Martha Agerich, piano; Mischa Maisky, cello.
Philips (DDD) 412 230-2
Sonata in A major, D959; 3 piano pieces, D946: Michel Dalberto, piano.
Erato ECD-88 116
Sonata in A, D.959: Claudio Arrau, piano.
Philips (DDD) 411 477-2
Sonatas in A minor, D.537; in A, D.664: Alfred Brendel, piano.
Philips (DDD) 410 605-2
Songs and ballads: Hermann Prey, baritone.
EMI 860952
String quartet, D810 'Death and the Maiden': Orlando Quartet.
Philips (DDD) 412 127-2
String quartet D810 'Death and the Maiden'; string quartet No 12, D703; Vermeer Quartet.
Teldec 8.42 868
String quartet No 15: Brandis Quartet.
Orfeo ORF C007
String quartets—'Death and the Maiden'; 'Quartettsatz', D703: Tokyo String Quartet.
MMG MCD 10004
String quartets in D minor, D810 'Death and the Maiden'; No 12 in C minor, D703 'Quartettsatz': Amadeus Quartet.
DG (DDD) 410 024-2
String quintet in C, D956: Douglas Cummings, cello; Lindsay String Quintet.
ASV DCA 537
String quintet in C: Heinrich Schiff; Alban Berg Quartet.
EMI 747018
String trios D471 and D581; arpeggione sonata: Les Musiciens.
Harmonia Mundi HM 90.1035
Symphonies No 7 (No 8) in B minor, D759 'Unfinished'; and No 5 in B flat major, D485: Staatskapelle Berlin, Otmar Suitner cond.
Denon C37-7156
Symphonies No 4 'Tragic' and No 5: Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 410 045-2
Symphonies No 5 & 8: Wiener Philharmoniker; George Solti cond.
Decca 412 371-2
Symphony No 8 'Unfinished'; and No 4 'Tragic': Basler Symphony Orch, Armin Jordan cond.
Erato ECD-88 008
Symphony No 8 'Unfinished'; plus—Symphony No 4 'Italian' (Mendelssohn): Philharmonia Orch, Guiseppe Sinopoli cond.
DG (DDD) 410 862-2
Symphony No 8 'Unfinished'; plus—Symphony No 8 in F (Beethoven): Cleveland Orch, Christolph von Dohnanyi cond.
Telarc 80091
Symphony No 8 'Unfinished'; Rosamunde overture and ballet music No 1 and No 2: Vienna Symphony Orch, Nikolaus Harnoncourt cond.
Teldec 8.43 187
Symphony No 8 'Unfinished'; music from Rosamunde D797: Boston Symphony Orch: Colin Davis cond.
Philips (DDD) 410 393-2
Symphony No 8 'Unfinished'; symphonic fragments in D, D708a; (completed and orchestrated by Brian Newbould): Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 412 472-2
Symphony No 8 (No 9) in C major, D994 'Great'; Staatskapelle Berlin, Otmar Suiter cond.
Denon C37-7371
Symphony No 9 'The Great'; Cleveland Orch.
Telarc 80110
Symphony No 9 in C Major, 'Great'; Berlin Radio Symphony Orch, Heinz Rogner cond.
Denon C37-7035
Symphony No 9: Chicago Symphony Orch, James Levine cond.
DG (DDD) 413-437-2
Symphony No 9: Wiener

Philharmoniker, Georg Solti cond.
Decca 400 082-2
The 10 symphonies; symphonic fragments; D615 and 708a; Including the completed version of the symphony No 8 in B minor, D759 'Unfinished'; realisations of the symphony No 7, D729 and No 10, D936a, and symphonic fragments D615 and 708a, by Prof Brian Newbould: Academy of St Martin-in-the-Fields, Neville Marriner cond.
Philips (DDD) 412 176-2
Winterreise: Hakan Hagegard, baritone.
RCA RCD14861
Winterreise D911; piano sonata in C: Peter Schreier, tenor; Sviatoslav Richter, piano.
Philips (DDD) 416 289-2 (2CDs)
Winterreise, D911: Hermann Prey, baritone; Philippe Bianconi, piano.
Denon C37-7240
Winterreise: Dietrich Fischer-Dieskau, baritone; Gerald Moore, piano.
DG (ADD) 415 187-2
Winterreise: Martti Talvela, bass; Ralf Gothoni, piano.
BIS BIS CD-253/4
Winterreise: Kurt Moll; Cord Garben.
Orfeo ORF C042 (2 CDs)

SCHUETZ
German Magnificat; Psalms of David.
Bellaphon 690.01.020
Italian madrigals: Consort of Musicke.
Harmonia Mundi 567-1 69 527-2
Sacred concerts: Concerto Vocale.
Harmonia Mundi HM 90.1097
Sinfonia Sacrae, Op 6; Venise 1629: Les Saqueboutiers de Toulouse.
Erato ECD-88 150
Swan-Song, Pts 1 and 2: Berlin Soloists.
Capriccio 10.049-50 (2 CDs)

SCHUMANN
Dichterliebe, Op 48; Liederkreis, Op 39, 7 lieder — Myrthen; Op 25: Dietrich Fischer-Dieskau, baritone; Christoph Eschenbach, piano.
DG (DDD) 415 190-2
Fantaseistucke Op 73; 5 Stucke im Volston Op 102; plus — sonata for arpeggione and piano (Schubert): Martha Argerich, piano; Mischa Maisky, cello.
Philips (ADD) 412 230-2
Fantasiestucke Op 12; fantasie in C Op 17: Alfred Brendel.
Philips (ADD) 411 049-2
Fantasiestucke Op 12; Liederkreis Op 39: Ursula Anders, soprano; Friedrich Gulda, piano.
Philips (DDD) 412 113-2
Lieder: Margaret Price.
Orfeo ORF C031
Novelettes Op 21; plus — 13 selected pieces from 24 preludes, Op 28: Sviatoslav Richter, piano.
Ariola-Eurodisc 880 015-231
Piano concerto; plus — Konzertstuck in F minor, Op 79, (Weber): Alfred Brendel, piano; London Symphony Orchestra, Claudio Abbado cond.
Philips (ADD) 412 251-2
Piano concerto: Krystian Zimmerman, piano; Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 410 021-2
Piano concerto; plus — piano concerto (Grieg): Radu Lupu, piano; London Symphony Orch, Andre Previn cond.
Decca 414 432-2
Piano concerto; plus — piano concerto No 2 (Chopin): Andras Schiff, piano; Concertgebouw Orch, Antal Dorati cond.
Decca 411 942-2
Piano music — Papillons, Op 2; 3 fantasiestucke; Humoreske: Andrea Nemecz, piano.
Sefel SE-CD 5021
Scenes from Childhood, Op 15; Forest Scenes, Op 82; Leaves of Different Colours, Op 99: Maria Joao Pires, piano.
Erato ECD-88 092
Scenes from Childhood; Kreisleriana: Martha Argerich, piano.
DG (DDD) 410 653-2
Symphonic studies; Arabesque; Maurizio Pollini, piano.
DG (DDD) 410 916-2
Symphony No 2; Manfred overture: Vienna Philharmonic Orch, Giuseppe Sinopoli cond.
DG (DDD) 410 863-2
Symphony No 3 'Rhenish'; Manfred Overture: Los Angeles Philharmonic Orch, Carlo Maria Giulini cond.
Dg (DDD) 400 062-2
Symphony No 3 'Rhenish'; Overture, Manfred: Concertgebouw Orch, Amsterdam; Bernard Haitink cond.
Philips (DDD) 411 104-2
The Four Symphonies; overtures — Manfred and Genoveva: Concertgebouw Orch, Amsterdam; Bernard Haitink, cond.
Philips (DDD) 412 126-2 (2CDs)
Toccata; symphonic studies: Ivo Pogorelich, piano.
DG (DDD) 410 520-2

SCHUMANN/LISZT
Piano music: Nina Lulchek, piano.
Telarc 80075

SHOSTAKOVICH
Cello concerto No 1; plus — cello concerto (Kabelevsky): Yo-Yo Ma, cello; Philadelphia Orch, Eugene Ormandy cond.
CBS CD 37840
Cello concertos: No 1. Op 107; No 2 Op 126: Heinrich Schiff, cello; Bavarian Radio Symphony Orch; Maxim Shostakovich.
Philips. (DDD) 412 526-2
Concerto No 1 for piano, trumpet, and strings; chamber symphony, Op 110a: Dimitri Shostakovich jnr, piano; J. Thompson, trumpet; I Musici de Montreal, Maxim Shostakovich cond.
Chandos CHAN-8357
Piano quintet and trio. Borodin Trio.
Chandos CHAN-8342
Symphony No 5: New York Philharmonic, Leonard Bernstein cond.
CBS CD 35854
Symphony No 5: National Symphony Orch of Washington, Mstislav Rostropovich cond.
DG (DDD) 410 509-2
Symphony No 5: Cleveland Orch, Lorin Maazel cond.
Telarc 80067
Symphony No 5: Concertgebouw Orch, Bernard Haitink cond.
Decca 410 017-2
Symphony No 8: Concertgebouw Orch, Bernard Haitink cond.
Decca 411 616-2
Symphonies Nos 6 and 11: Concertgebouw Orch, Bernard Haitink cond.
Decca 411 616-2 (2CDs)
Symphony No 10: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 413 361-2
Symphony No 11 in G minor, Op 103, 'The Year 1905'; USSR Ministry of Culture State Symphony Orch, Roshdestvensky cond.
Ariola-Eurodisc 880 019-231
Violin concerto; plus — violin concerto (Syzmanowski): Lack; Berlin Symphony Orch, Kohler cond.
MMG MCD 10013
Violin sonata; plus — violin sonata (Schnittke): R. Dubinsky, violin; Luba Edlina, piano.
Chandos CHAN-8343

SIBELIUS
Finlandia; The Swan of Tuonela; Valse Triste; Tapiola: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 413 755-2
Maiden In The Tower — opera in one act; Karelia suite: Haggander; Hynninen; Hagedard; Kruse; Gothenburg Concert Hall Choir; Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-250
Orchestral Songs: Mari Anne Haggander, soprano; Jorma Hynninen, baritone; Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-270
Pelleas et Melisande; plus — Peer Gynt suites (Grieg): Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 410 026-2
Symphony No 1; plus — Karelia Suite: Philharmonia Orch, Vladimir Ashkenazy cond.
Decca 414 534-2
Symphony No 1 in E minor; Finlandia: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-221
Symphony No 2 in D; romance in C: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-252
Symphony No 2: Scottish National Orch, Alexander Gibson cond.
Chandos CHAN-8303
Symphony No 2: Finlandia: Cleveland Orch.
Telarc 80095
Symphony No 2: Philharmonia Orch, Vladimir Ashkenazy, cond.
Decca 410 206-2
Symphony No 3 in C; King Kristian II suite: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-228
Symphony No 4: Finlandia; Luonnotar: Elisabeth Soderstrom; Philharmonia Orch, Vladimir Ashkenazy cond.
Decca 400 056
Symphony No 4 and No 6: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 415 108-2
Symphony No 5; En Saga: Philharmonia Orch, Vladimir Ashkenazy cond.
Decca 410 016-2
Symphony No 5 in E flat; andante festivo for string orch; Karelia overture: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-222
Symphony No 5: Philharmonia Orch, Simon Rattle cond.
EMI 747006.
Symphony No 6; Pelleas and Melisande suite: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-237
Symphony No 7; Tapiola: Philharmonia Orch, Vladimir Ashkenazy cond.
Decca 411 935-2
Symphonies No 1 and No 7: Scottish National Orch, Alexander Gibson cond.
Chandos CHAN-8344
Symphonies No 3 and 6: Philharmonia Orch, Vladimir Ashkenazy cond.
Decca 414 267-2
Symphony No 4 in A minor: Canzonette; Oceanides Op 73: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-263
Symphony No 5 and No 7: Berlin Philharmonic Orch, Herbert von Karajan cond.
DG (DDD) 415 107-2
Violin concerto; — plus intro and rondo capriccioso (Saint-Saens): Dylana Jensen, violin; Philadelphia Orch, Eugene Ormandy cond.
RCA RCD 14548
Violin concerto; plus — violin concerto (Schumann): Gidon Kremer, violin; Philharmonia Orch, Riccardo Muti cond.
EMI 747110
Violin concerto: Itzhak Perlman, violin.
EMI 747167

SMETANA
Libuse: Benackova; Prague Nat Theatre, Kosler cond.
Supraphon. SUP CD7438/40 (3 CDs)
Ma Vlast — complete: Czech Phil Orch, Smetacek cond.
Supraphon SUP CD7241
My Fatherland; The Bartered Bride — overture; Furiant and Dance of the Comedians: Gewandhaus Orch Leipzig, V. Neumann cond.
Teldec —8.35 672 (2 CDs)
The Bartered Bride: Benackova; Dvorsky; Czech Phil Orch and Chorus, Kosler cond.
Supraphon SUP CD7309/11 (3CDs)

SOUSA
Peaches and Cream — dances and marches: Cincinatti Pops Orch, Erich Kunzel cond.
MMG MCD 10005
Stars and Stripes Forever; Famous Marches: Philip Jones Ensemble, Elgar Howarth cond.
Decca 410 290-2
Treasury of Sousa Marches: Coldstream Guards.
Sefel SE-CD 5000

SPOHR
Symphony No 3; overture — Jessonda: Berlin RSO, Albretch cond.
Schwann SCH 11620

STANLEY
Organ concertos, Op 10, No 1-6: Gerald Gifford, organ; Northern Sinfonia.
CRD CRD 3409

STENHAMMAR
Excelsior Overture; Symphony No 2 in G minor: Gothenburg Symphony Orch, Neeme Jarvi cond.
BIS BIS CD-251

STRAUSS, J
Blue Danube; etc: Hungarian State Orch, Janos Ferencsik cond.
Hungaraton HCD 12600-2
Die Fledermaus: Willi Boskovsky cond.

TO BE CONTINUED

Due to a limit on space in this issue, we will conclude our listing of classical and popular compact discs in the March issue.

EASTCOM
Eastern Communication Centre

ELECTRONIC BROKERS AUSTRALIA
Communication, Electronics, Computer and Test Equipment.

168 Elgar Road,
Wattle Park,
Vic. 3128
288 3611 288 3107
Keith or Dave

We carry full range of:
ICOM
KENWOOD
YAESU

Ham, SWL, CB and Communication gear, accessories etc.

WE WILL TRADE!

ALL IBM and Apple Compatable Computers, Hardware, Software and accessories available. Demonstrations available.

HAM PACK III MODEM for IBM and APPLE. Ring for details.

A FULL RANGE OF COMPONENTS

Large range of New and Secondhand Test Equipment available, stock changing daily.

Full service and changeover available from our new Computer Service Centre. Repairs to Disc Drives a speciality.

COMPUTER SERVICES CONTRACTS AVAILABLE

50 and 25 years ago...

"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly 3d

February 1936

Driverless tractors: in recent years the public's imagination has concurrently been stirred by reported experiments in the field of wireless power transmission and long distance control. Driverless automobiles have been picking their way through traffic, crewless ships ploughing the sea, pilotless 'planes taking off and landing; bombs, rockets and torpedoes shooting unerringly to their mark.

Into this field of scientific experimentation stepped the International Harvester Company with the first radio controlled farm tractor. There is no need (according to the inventors) for a farmer nowadays to sit uncomfortably all day long on the seat of his tractor.

French television: the new high power television transmitter begins in Paris in April; a move to pull down the Eiffel Tower has been met by a demand that the tower shall be saved for television broadcasts.

Maiden voyage: short wave listeners are due for some real thrills when the gigantic trans-Atlantic liner, the Queen Mary, takes to the water shortly. The BBC advises that in co-operation with the Cunard White Star Company, arrangements are being made for broadcasting from this floating palace each evening during the maiden voyage from England to America.

Lifeboat radio: on January 1, new sea-safety regulations were introduced in USA waters. All ocean going passenger vessels of 2500 tons now have the added safeguard of lifeboats with radio telegraph equipment capable of communicating at least fifty miles.

RADIO TELEVISION AND HOBBIES 2/6

February 1961

New RAAF fighter: for many years, the Royal Australian Air Force has been using the Avon Sabre as its front line fighter, but it is now obsolete in this role.

The Federal Government recently announced its intention of equipping the Royal Australian Air Force with the French designed Mirage III fighter.

From the very outset, design of the Mirage has been directed toward attaining the greatest possible versatility in service. The plane is eminently suitable for interception, for tactical support, ground attack, long range bombing and photographic reconnaissance.

Battery powered watch: manufactured by the Bulova Co, the "Accutron" watch is powered by a 1.3V mercury cell, similar to those in hearing aids. Housed beneath a cap in the rear of the case, the cell powers the watch for one year. A recessed control, also on the back of the case, allows the hands to be set.

Checking transistors: leaks in the cases of transistors allow the ingress of water vapour and oxygen, both of which shorten the life of the transistor.

At the moment, the main method of testing is to submit the devices to a humidity test and check the electrical characteristics for deterioration.

An alternative method, which is claimed to be quicker, subject to less error, non-destructive and suitable for large or small quantities, is testing by immersion in radioactive gas. After removal from the gas, the amount inside the component is measured by means of a radiation counter.

When it comes to computer components

A is for Adaptive Electronics

Sole authorised Australian Distributors for Tandon floppy and hard disk drives.
Importers of DTC and KONAN controllers, power supplies, etc.

HARD and FLOPPY drives for
— IBM, PC, XT and AT, and compatibles
— Tandy TRS80 Model 2 & 3
— Apple IIe and compatibles

10, 20, 30, 36, 50, 85, 130 MBYTE

Tape backup units also available

---

418 St Kilda Road, Melbourne 3004. ☎ (03) 267 6800

WE SPECIALIZE IN BEING CHEAP!!

New and Second Hand Computers for Sale

NEW!
BRAND
NEW

IBM Workalikes
$1300 — Check
out the quality
Monitors $169

SPECTRAVIDEO
328 with CP/M
disc drive & basic
Printer port, etc.
$599

SPECTRAVIDEO
Model 328 w. data
cassette, joystick
10pcs, software
$299

IBM compatible
floppy $149
hard $899

APPLE MAC
Best Price in town
Modems from $99
Epson Printers

Manufacturers and retailers surplus stocks

SECOND
HAND
SPECIALS!

VIDEO TERMINALS
from $99 working

Printers
from $50

Cromemco
Computers
from $999

Instrument Cases
$10

Disk drives
from $10

Diskettes $199
Paper $10
SV Cartridges $20

Computers in stock
IBM, APPLE, NCR,
Spectravideo.

We also desperately require stock — New and Second hand ask us to quote

COMPUTER SECOND
The home of the affordable computer
76 St Kilda Road
(03) 537 2267

Information centre

Power supply for portable refrigerator

Can you please provide me with a design for a mains power supply, as follows: 12VDC negative ground, 4 to 4.5 amps output, regulated to ±0.25V, with ripple voltage not to exceed 10%.

The DC load is nominally constant. The supply is required for a small refrigerator using a thermo-electric heat pump (Peltier effect). Your help would be much appreciated. (R.O., Macleod, Vic.)

- The circuit which would most closely suit your needs is the VK Powermate, published in the December 1983 issue of *Electronics Australia.* This has a nominal 13.8V output at up to 10A but it can be modified to suit your lower output requirement.

To this end, leave out one of the 2N3055 output transistors and one of the 10,000μF filter capacitors, and change the fuse to a 5A rating.

CB-controlled relay

I want a unit to trip a relay via a CB radio at the press of a button. To be more specific, when the CB receives a signal, I want it to trip a relay which will operate a bell or car horn to alert the operator of a specific call.

I envisage using a high pitched tone as the signal to trigger the circuit. The receiver would have a very selective bandpass filter tuned to the same pitch. When the pitch is received for one or two seconds, the relay should be operated.

What I really need your help on is the bandpass filter. Also, I need a way to delay the relay for one or two seconds. Can you help? (H.R., Woodend, Vic.)

- We have just the circuit for you. Back in January 1978, we published a "Selective Tone Caller for CB". We can supply photostats of the article for $4, including postage.

Ignition killer for Kingswoods

I intend to build three of the Car Ignition Killer units described in EA, September 1985. I am not sure how well the unit will operate on a vehicle which is fitted with a ballast resistance type coil (one of my vehicles is a 3.3-litre HZ Kingswood). These only have about 5V when the ignition is turned on, 12V in start position, and up to about 9V when the engine is running.

My question is will these voltages (5V to 9V) be sufficient to operate the unit and then pull in the 12V relay? (J.W., Doncaster, Vic.)

- The circuit is fully compatible with the ignition circuit of the HZ Holden. Indeed, we have not yet come across an ignition circuit which it will not work with. Note that the Ignition Killer should not be powered via the ballast resistor, but should go directly to 12V via the ignition switch.

High-power 300W Inverter

I have constructed the 300W inverter from June 1982 but have encountered several problems with it. Firstly the 1.5A fuse often blows, due to the SCR conducting, when a heavy load is placed on the inverter. When this first happened, I had to replace the SCR, IC1 and IC6. Could this be due to a high voltage spike and if so would a zener diode placed across the +V2 supply cure the problem?

The second problem is that sometimes upon switching it on, the output frequency is 100Hz and it is necessary to switch on and off several times to get a 50Hz output. The transformer buzz is also loud. Is this normal?

The third and most serious problem is

Cure for Playmaster 40/40 oscillation

For some time I have had a problem with the Playmaster 40/40 amplifier which was constructed in 1980. Initially, there was a noticeable hum in the left channel combined with low gain, and the operation of the balance, bass and treble controls was scratchy, both channels being affected. The symptoms disappeared some 15 minutes after turn on and didn't appear to affect the phono inputs to a marked extent.

I sought advice from EA in June or August 1980 when you suggested instability in the T3/T103 emitter follower stages and suggested fitting a 1kΩ resistor in series with the 0.1μF input capacitor to that stage. This was duly done with little effect and on various occasions since I have checked all components through to the power amplifier input stages, replacing some and checking all others and the joints with freon.

Recently I found that touching various components in the vicinity of T4/T5 reduced or cured the problem! A permanent cure seems to have resulted from the fitting of a 0.1μF monolithic bypass capacitor between the +15V preamp power supply rail, where the link to T5 takes off, and the main earth track to the preamp section, the track just being wide enough to take a lead and the monolithic capacitor being a neat fit.

What I don't know is the cause and whether I am masking some underlying fault condition, however the above may be of some interest to you. (J.L., Ravensthorpe, WA.)

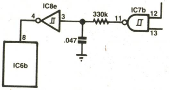
- It would appear that your problem was due to instability of transistor stage T5. Your method of fitting a 0.1μF bypass capacitor is a perfectly valid cure for this problem. It is possible, under the right conditions, for any emitter follower to oscillate. It actually becomes a sort of grounded base oscillator with the inductance of the supply leads forming its collector load.

By connecting a 0.1μF capacitor to the collector of T5, you have very effectively prevented this from happening. However, yours is the first case we have heard of which involved T5 and is possibly due to a transistor with an unusually high gain-bandwidth product.

Multi-Sector Burglar Alarm

Recently, I constructed the Multi-Sector Burglar Alarm Kit. Once installed, I found that the unit was very susceptible to false triggering, even with all sector inputs disabled and the unit running direct from the battery (mains disconnected).

If anyone else has experienced this problem, the cure is shown in the accompanying diagram. Basically, it consists of adding an RC filter circuit to pin 11 of IC7b. In addition, the .01μF capacitor on pin 13 of IC5f should be changed to .047μF to extend the length of the test pulse. (B.H., The Gap, Qld.)



- As far as we know, only a few people have experienced this problem. Thank you for this information.

that the inverter will not operate induction motors or fluorescent lights unless a 4.7μF capacitor is placed across the 240V output. Would the voltage regulation circuit be responsible for this problem? Would the inverter be damaged by permanently connecting a capacitor across the output?

Finally, how accurate is a digital voltmeter when used to adjust the output voltage?

- We hope that you have seen the errata (December 1985) concerning the SCR orientation. It is shown incorrectly on the overlay diagram and should be positioned so that the metal body faces the edge of the PCB. A 16V 1W zener diode across the +V2 supply will prevent any spikes damaging the CMOS ICs and also possibly triggering the SCR.

To prevent the crystal operating in the first overtone mode (8MHz) and therefore giving 100Hz output, we suggest that the 47pF capacitor at pins 1 and 2 of IC1a be increased in value until the problem is cured.

The buzz from the transformer can be reduced by tightening the screws holding the transformer together. However, it normally has some buzz.

A 4.7μF capacitor will not damage the inverter but it should be non-polarised and rated at 250VAC. The problem with the inverter when powering very inductive loads is that the voltage sensing circuit only measures average rather than RMS values. The capacitor corrects for the power factor between current and voltage.

We have found that a digital multimeter which reads average voltage rather than RMS, is accurate enough for voltage settings on this inverter. This is providing a resistive load such as light bulbs is used.

Playmaster Mosfet Stereo Amplifier

I have just completed construction of the Playmaster Mosfet stereo amplifier published in the Dec '80, Jan '81 and Feb '81 issues of *Electronics Australia.* Purchased as a kit from Dick Smith Electronics, I am proud to say that the unit worked perfectly first time. After some testing with a signal generator and a dummy load, and ultimately with program material, the unit gave excellent performance.

I am writing this letter to clear up something I don't fully understand. The problem concerns earthing the input shield and 0V rail to the chassis and therefore to the mains earth.

In the wiring diagram for the chassis wiring, all the shields on the input sockets along with the separate earth terminal are shown connected to the chassis. After tracing the printed circuit board pattern, I confirmed that the 0V rail is connected to the chassis. There is no such connection shown on the wiring diagram.

The article states that the headphone socket must be insulated from the chassis and a separate wire run for the speaker lead return (which I have done). Why is it necessary to insulate the headphone socket if the 0V line is connected to chassis anyway? Furthermore, the two 0.47μF caps connected to the speaker terminals from 0V to chassis are effectively shorted out.

On reading the May '79 issue on the Graphic Equalizer, I noticed that the input shields and the 0V line are not connected to chassis there. Why?

Also, I would like to suggest using a GE MOV varistor (250V) across the mains for spike suppression as I feel this is much more effective than a capacitor.

FOR QUALITY AND VALUE TALK TO THESE PEOPLE ABOUT FLUKE MULTIMETERS

A.C.T.

Actiec Pty Ltd
34 Geelong St. Fyshwick
(062) 80 6576

N.S.W.

Ames Agency Pty Ltd
605 Elizabeth St. Redfern
699 4524

George Brown & Co Pty Ltd
174 Parramatta Rd.
Camperdown - 519 5855
Newcastle - 69 6399
Canberra - 80 4355

Bryan Catt Industries Pty Ltd
10/59-61 Gymea Bay Rd.
Gymea
526 2222

Collier Tools (Aust) Pty Ltd
185 Parramatta Rd.
Homebush
763 1888

D.G.E. Systems Pty Ltd
103 Broadmeadow Rd.
Broadmeadow
(049) 69 1625

Davred Electronics Pty Ltd
127 York St. Sydney
267 1385

W.F. Dixon & Co Pty Ltd
P.O. Box 42. Wickham
(049) 61 5628

Macelec Pty Ltd
99 Kenny St. Wollongong
(042) 29 1455

Paul's (Merchants) Pty Ltd
22 Canterbury Rd.
Bankstown
709 2311

Radio Despatch Service
869 George St. Sydney
211 0291

Selectro Parts Pty Ltd
482 Hume Hwy. Yagoona
708 3244

Standard Communications
Pty Ltd
6 Frank St. Gladesville
896 1755

Geoff Wood Electronics
Pty Ltd
656A Darling St. Rozelle
810 6845

WESTERN AUSTRALIA

Atkins Carlyle Ltd
1 Milligan St. Perth
321 0101

Dobbie Instruments (Aust)
Pty Ltd
9 Boag Rd. Morley
276 8888

Cairns Instrument Services
32 Wickham St. East Perth
325 3144

Willis Trading Co Pty Ltd
165 Albany Hwy.
Victoria Park
470 1118

VICTORIA

Radio Parts Pty Ltd
562 Spencer St.
West Melbourne
329 7888

G.B. Telespares Pty Ltd
504 Queensbury Rd.
North Melbourne
328 3371

Browntronics Pty Ltd
93 Sackville St. Collingwood
419 3986

R.K.B. Agency
20 Council St. Hawthorn
82 7704

A.J. Ferguson & Co Pty Ltd
558-568 Swanston St. Carlton
347 6688

SIRS Sales Pty Ltd
4 Edols Pl. North Geelong
(052) 78 1251

TASMANIA

George Harvey Electrics
Head Office
76 York St. Launceston
(003) 31 6533
Hobart - (002) 34 2233

SOUTH AUSTRALIA

Protronics Pty Ltd
174 Wright St. Adelaide
212 3111

Trio Electrix Pty Ltd
177 Gilbert St. Adelaide
212 6235

Redarc Electronics
253 Main Rd. Blackwood
278 7488

QUEENSLAND

L.E. Boughen & Co
33 Railway Tce. Milton
369 1277

Colourview Wholesale
5 Commerce St. Salisbury
275 3188

Fred Hoe & Sons Pty Ltd
246 Evans Rd. Salisbury Nth
277 4311

Nortek
36 Punari St. Townsville
(077) 79 8600

St Lucia Electronics
71-77 Brunswick St.
Fortitude Valley
52 7466

Selectro Parts (Qld)
44 Esher St. Ekibin
394 2422

NORTHERN TERRITORY

Thew & McCann (NT) Pty Ltd
Menmuir St. Winellie Darwin
(089) 84 4999

FLUKE ®

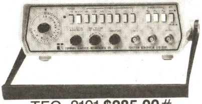
ELMEASCO
Instruments Pty. Ltd.

NEW SOUTH WALES
15 McDonald Street,
MORTLAKE
P.O. Box 30, CONCORD
NSW 2137
Tel: (02) 736 2888
Telex: AA25887

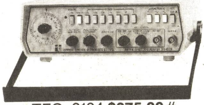
VICTORIA
12 Maroondah Highway,
RINGWOOD
P.O. Box 623, RINGWOOD
VIC 3134
Tel: (03) 879 2322
Telex: AA30418 ELTENT

QUEENSLAND
Tel: (07) 369 8688
S. AUSTRALIA
Tel: (08) 344 9000
W. AUSTRALIA
Tel: (09) 481 1500

Topword Function Generators



TFG–8101 **$285.00#**



TFG–8104 **$375.00#**

FEATURES

- Sine, Square, Triangle, Ramp, AM*, FM*
- 0.1 Hz to 2MHz 7 Ranges
- Attenuator 0dB to 30dB
- VCF (Voltage Control Frequency)
- Polarity Invert
- High Output Voltage 20VP-P
- Duty Variable with Calibration Switch
- D.C. offset Variable with Zero Switch
- Amplitude Modulation 0 to 100%*
- Frequency Modulation 0 to 10%*

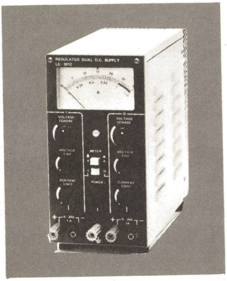
#Plus 20% Sale Tax if applicable
*Specification for TFG-8104 only

DEALER ENQUIRIES WELCOME

P.E. PACIFIC ELECTRONICS

45 Wellington Street,
Windsor, Vic 3181
☎ Phone (03) 529 8500
Telex AA 38432

LABORATORY POWER SUPPLIES



APLAB offer a complete range of regulated DC bench/rack power supplies combining high precision and regulation capabilities with continuously adjustable outputs.
Designed with single, dual and multiple outputs, these power supplies can be used in either constant voltage or constant current mode of operation.
Standard models include:

SINGLE OUTPUT
OUTPUT: Output
VOLTAGE: Current
0-30V 0-1A to 30A
0-70V 0-2A to 10A

DUAL OUTPUT
0-30V 0-1A to 2A

MULTIPLE OUTPUT
0-30V 0-2A to 5A

Ex Stock

SCIENTIFIC DEVICES AUSTRALIA PTY. LTD.
VIC. 2 JACKS RD., SOUTH OAKLEIGH. 3167
PHONE: (03) 579 3622 TELEX: AA32742
NSW: 559A WILLOUGHBY RD., WILLOUGHBY 2068
PHONE: (02) 95 2064 TELEX: AA22978
S.A. 31 HALSEY RD., ELIZABETH EAST. 5112
PHONE: (08) 255 6575 TELEX: AA88125

Information Centre . . . ctd

(I have installed one in my unit). (S.S., Lilyfield, NSW.)

- The headphone socket must be insulated from the chassis to prevent signal return current from flowing in the preamplifier. If this was not done the amplifier as a whole would tend to be unstable and would either motorboat or produce a loud hum output.

At the same time, the two .047μF capacitors connected to the speaker socket render the amplifier less prone to RF interference picked up by the speaker cables. They are shorted out at DC but not at radio frequencies.

As for the Graphic Equalizer, the arrangement of the input shields and the 0V line is to minimize hum and susceptibility to radio interference.

Your suggestion of using a GE MOV varistor for spike suppression is a good one, although most amplifiers seem to be effectively protected by the capacitor specified.

Problem with Musicolour IV

I recently completed a Musicolour IV kit and am using 100W flood lamps similar to those pictured in the EA article. Everything works OK and I am satisfied with the result except for one small problem.

The problem is that at volume levels that I find comfortable, there is insufficient signal to drive the lamps, even with the sensitivity control at maximum.

I have thought of adding a simple amplifier to the input signal external to the Musicolour, but my technical capabilities are very limited. Any suggestions you could make, or a reasonably convenient solution, would be appreciated. (A.M., Gladesville, NSW).

- You haven't stated whether you are driving the Musicolour from the loudspeaker terminals or whether you are using the microphone pickup.

In either case, the best initial approach would be to increase the gain of IC1d by reducing the value of the 10kΩ resistor on pin 14. Similarly, the gain of the microphone preamplifier (IC1a) can be increased by reducing the 10kΩ resistor on pin 1.

Note that halving the resistor value will double the gain of the stage.

Finally, if you have a low-power amplifier, you can also increase the 1kΩ resistor in the input attenuator.

Notes & Errata

12-230V 300VA INVERTER (September 1985, 3/IT/14): the load voltage regulation may be significantly improved by reducing the 1MΩ resistor between pins 6 and 7 of IC7b to 680Ω. While this may appear to be a drastic change, IC7b is within a voltage regulation feedback loop and so the overall effect of such a gain reduction is not great.

To ensure output regulation with varying battery voltage, it is important that the output of the LM317T regulator be no more than 9V. Check this with a multimeter and, if necessary, adjust the values of the resistors connected between the adjust terminal and ground of the regulator for a 9V output. For example, to reduce the output voltage, reduce the value of either the 680Ω resistor or the 100Ω resistor.

Note that output regulation with large loads can only be achieved by minimising voltage drops in the high current primary circuit. This involves using the recommended 1.6mm diameter wire as indicated on the wiring diagram. In addition, make sure that the terminations between the automative battery clips and the leads are of low resistance. Solder the leads to the clips if necessary.

Finally, the inverter can deliver its maximum capacity of 300VA for short periods of time only (about 20 minutes in a 25°C ambient) before overheating. If it is envisaged that the inverter will be operated continuously at 300VA, larger heatsinking will be necessary.

For continuous loads up to 200VA, the specified heatsinks, which have a thermal resistance of 7.2° C/W, are adequate. Alternative heatsinks should have an equivalent or better thermal resistance.

ELECTRIC FENCE CONTROLLER (December 1985, File 3/MS/119): The part number given for the Philips potcore assembly is obsolete. The current part number is 432202022010 and the part is described as a T26/16, 318 potcore half. Two halves are required for the complete assembly.

Similarly, two Siemens B66339-G-X127 core halves are required, not one as indicated in the parts list.

L. E. CHAPMAN
122 PITT ROAD, NTH CURL CURL.
MAIL ORDERS: BOX 156, DEE WHY. NSW. 2099.
TELEPHONE 93-1848.

SUPER SPECIAL
BSR GRAMO MOTOR AND PICKUP 240V
3 speed 33-45-78 includes cartridge and stylus turnover
$12
P&P NSW $2.75 INTERSTATE $4.20 WA, NT $5.20

SUPER SPECIAL
FM STEREO KITS
World famous makes. Sets of 3 modules includes FM Tuner, Decoder and IF detector. Circuit diagram supplied.
ONLY $22
PP $1.60

BSR BELT DRIVE SUPER SPECIAL
Recond player 2 speed 33 and 45 RPM 11 inch turntable pickup arm counter balanced cuing facility. Ceramic cartridge, diamond stylus works off 240V 9V or 12V.
$39
P.P. $5.50

SPECIAL
BALANCE METERS
CENTRE ZERO
$2
PP $1

SPECIAL DUAL VU METERS
$3
PP $1

TOUCH MICRO SWITCHES
4 for $1

TRANSISTORS
AD 161-162 $1 pair
AD 149 $2 pair

MICRO SWITCHES
5A 250 volt 50c.

VALVE SOCKETS
7 pin 4 for $1
9 pin 4 for $1
OCTAL 4 for $1

ICs 20 MIXED TYPES
$2

TAG STRIPS
Mixed 10 for $1

5 MIXED ROTARY SWITCHES
$2.50

MIXED SWITCHES
12 for $4.50

CHROME ¼ PUSH ON KNOBS
10 for $1

MIXED RESISTORS
100 for $2 all handy values

SLIDE POT KNOBS
10 for $1

SHIELDED CABLE
Single strand.
25 metres for $2.50

MIXED CAPACITORS
Fresh stock 100 for $2

TOGGLE SWITCHES
4 for $1

TV COLOUR CRYSTALS
4433 — 619kHz $2

TRANSISTOR EAR PIECE PLUG AND LEAD
4 for $1

STICK RECTIFIERS
TV 20 SC $1 each

SPARK GAPS
10 for $1

CAR RADIO SUPPRESSORS
4 for $1

THERMISTERS
4 for $1

SLIDE POTS

1½ Meg DUAL	$1	5K single	50c
1 Meg dual	$1	250K single	50c
2 Meg dual	$2	10K single	50c
250K dual	$1	2 Meg single	50c
1K dual	$1	25K dual ganged	$1

EA marketplace EA marketplace

ADVERTISING RATES FOR THIS PAGE

SMALL ADS: The minimum acceptable size of 2 centimetres x one column costs only $40. Other sizes up to a maximum of 10 centimetres are rated at $20 a centimetre. CLASSIFIEDS: $4 for 40 letters. Just count the letters divide by 40 and multiply by $4, ROUND UP TO NEAREST WHOLE NUMBER. CLOSING DATE: Ads may be accepted up to the 18th of the month two months prior to issue date. PAYMENT: Please enclose payment with your advertisement. Address your letter to THE ADVERTISING MANAGER, ELECTRONICS AUSTRALIA, PO BOX 227, WATERLOO, NSW 2017.

FOR SALE

AMIDON FERROMAGNETIC CORES: Large range for all receiver and transmitter applications. For data and price list send 105X220 SASE to: R.J. & U.S. Imports, PO Box 157, Mortdale, NSW 2223. NSW: Geoff Wood Electronics, Rozelle. ACT: Electronic Components, Fyshwick Plaza. VIC: Truscott Electronics, Croydon. WA: Willis Trading Co, Perth.

MAGAZINES: RH/EA. Complete set from April 1942 to December 1983. Contact (03) 787-1344. Prefer to sell as one lot.

BUILD AN 8K TO 256K: Centronics Parallel Printer Buffer. Has single/multiple copy, Hex output mode, and ROM diagnostics to aid kit builders. Uses only Z80A, 8255, 2716, 74LS00, 74LS04, and dynamic RAMS. Instructions board and EPROM $39. For more info, send SAE to Don McKenzie, 29 Ellesmere Cres., Tullamarine 3043.

One Stop
Electronic Shop

Full range of Toroidal Transformer from 15 — 625VA
AEM Modem kit **$150**
8 Songs Melody IC kit **$17.00**
Japanese Data Book **$22.00**

Hi-Com Unitronics
7 President Lane
Caringbah
NSW 2229
Ph: (02) 524-7878

DO YOU WANT TO BE A RADIO AMATEUR?

The Wireless Institute of Australia, established in 1910 to further the interests of Amateur Radio, conducts a Correspondence Course for the A.O.C.P. and L.A.O.C.P. Examinations conducted by the Department of Communications. Throughout the Course, your papers are checked and commented upon to lead you to a successful conclusion.
For further information, write to:

THE COURSE SUPERVISOR
W.I.A. (N.S.W. DIVISION)
P.O. Box 1066
PARRAMATTA, N.S.W. 2150.

DISCO CHASER: Very heavy duty non-inductive 10A/Ch 1 yr warranty excludes 25A triacs $265 post free. Ph: (07) 870-3287. 37 Woodstock Road, Toowong 4066.

PCB-SERVICE: Single sided 8c, double sided 11c per cm^2, drilling 3c per hole (plus COD). Send artworks on film or paper to Dunas Electronics, 23 Victoria Street, Burwood 2134. Tel. 747-5449.

VIATEL MODEM

The mini sized modem with a maxi punch.
Viatel system at the flick of a switch; 75/1200 (equalised); 1200/75 (equalised); 1200 HD (half duplex); 300 Baud — answer; 300 Baud — Originate; Switched Bell System, switches all modes to bell system; CTS LED display (clear to send); CD LED display (carrier detect); Will work on any computer with RS 232 port; Full instructions; Telecom approved components used throughout. Attractively finished. Using the latest up to the minute technology. This has allowed us to reduce the thunderer modem to a handy size (15 × 8 × 5cm). Will fit into any nook. Doesn't need a shelf of its own. Standard Accessories: RS232 plug and line; Phone plug and line. (All three wired into unit. Ready to go). Power supply.
We're so confident of the quality and durability of our product we are offering a two year guarantee, free of labour and parts costs.

$230.00 (without phone) **$250.00** (with PB/last re dial phne) Post & pack $10.00; Please note. Unit is fully assembled, tested and thundering to go!

Bankcard. Mastercard. American Express welcome.

ACETRONICS PCB's
112 Robertson Road, Bass Hill 2197
Ph: (02) 645-1241

GENERATE ELECTRICITY FROM THE SUN

ARCO PV PANELS

M73B 40 WATTS 12V

Provide power for pumping, lighting and refrigeration. Now only $295 each.

ELANTE PTY LTD
5 CREMORNE ST, RICHMOND, VIC.
Phone (03) 429 9733

RCS RADIO PTY. LTD.

Established 1933
IS THE ONLY COMPANY
WHICH MANUFACTURES AND
SELLS EVERY PCB & FRONT PANEL
published in EA and ETI
651 Forest Road Bexley 2207
AUSTRALIA
RING (02) 587 3491 FOR INSTANT PRICES
24-HOUR TURNAROUND SERVICE

HI FI SPEAKER KITS: Raw drivers, X-overs, plans, replacement speakers and accessories from the world's finest manufacturers. For audiophiles and beginners. Dynaudio, Focal, Foster, Kef, Magnavox, Peerless, Scanspeak, Vifa etc. "Siderealkaps", premium audio grade capacitors just arrived from USA. We ship anywhere within Aust and export to NZ and Pacific. Send $2 for latest catalogue. Audiocraft, PO Box 725, Toowong, Brisbane, Australia 4066.

EX-ABC AUDIO TAPES: ¼″ wide on 10½″**Standard** metal spool $6.85 **Robust** metal spool $7.85. 7″ spool $2.25. 5″ spool $1.25. Post extra. Also in stock ½″, 1″ and 2″ tapes. Waltham Dan, 96 Oxford St., Darlinghurst, Sydney. Phone (02) 331-3360.

COMPONENT SELLOUT: Resistors metal film, 5% E12 series. Kit 1, ¼W 10 of each value (840 resistors). Kit 2, ½W as kit 1. Kit 3, linear pots 2 of each value — 500Ω, 1, 5, 10, 25, 50,100, 250, 500K, 1, 2 and 3M. Kit 4, electro caps, 5 of each 4.7, 10, 22, 33, 47, 100, 220, 330, 470, 1000µF (all 25V) 1000 and 2200µF 63V. All kits $13 ea plus $2 P.&P. ea. D. Johnson, P.O. Box 103, Sylvania Southgate 2224.

NEW RADIO VALVES: For entertainment or industrial use. Waltham Dan, 96 Oxford St, Darlinghurst, Sydney. Phone (02) 331 3360.

PRINTED CIRCUIT BOARDS
Minimum postage & packaging on all EA & ETI Project PCBs.
Catalogue 1976-85 (inc components) $1.50.
PCBs made to order — 48 hr prototype service.
Bankcard/Mastercard.
Acetronics PCBs
112 Robertson Rd, Bass Hill 2197
(02) 645 1241

BENCH TECHNICIAN

Experience in communications essential, ie FM, HF, mobile communications.
PLEASE APPLY TO DASYL AVIONICS IN WRITING OR BY PHONE.

DASYL AVIONICS
P.O. BOX CP40
CONDELL PARK, NSW 2200
Phone (02) 708 5911
ask for Mr Prior

A NEW CONCEPT FOR LOW VOLTAGE PROJECTS

COPPER FOIL TAPE: thin pure copper tape backed by special hi-tack adhesive. Current carrying capacity, 5 amps, FULLY TESTED at 24V 5A. Not recommended for mains voltage.
4mm...RRP $8.03 6mm...RRP $9.84 33 metre rolls
GIFFORD PRODUCTIONS
PO BOX 62 St Kilda, Vic 3182 (03) 534 3482

FOR SALE . . . FOR SALE . . . FOR SALE . . . FOR SALE . . .

A.C.E. RADIO

136 VICTORIA RD, MARRICKVILLE, NSW 2204.
PHONE 51 3845.

PROUD TO BE AUSTRALIAN

ELECTRONICS CENTRE

AFTER 45 YRS OF HIGHLY SUCCESSFUL TRADING . . .
A.C.E. RADIO IS FOR SALE . . . OWNERS RETIRING
IF YOU ARE ENTHUSIASTIC AND ENERGETIC, THIS IS THE OPPORTUNITY TO MAKE A VERY REWARDING INVESTMENT.
ALL SURPLUS STOCK MUST GO . . . NOW. MAKE US AN OFFER WE CAN'T REFUSE.

JUMBO CABINETS
WAS $24.95
ONLY $15.95
P.P. NSW $4.50. V.SA.Q.T. $6.50 WA. NT. $8.50
Heavy duty ABS plastic • Detachable U-shape top and bottom, front and back panels • Front panel has cut-outs, and will easily accept a blank Dimensions 350mm (W) x 130mm (H) x 350mm (D)

★NEW MODEL★
50 WATT RMS SPEAKERS
ETONE FACTORY SCOOP
EVEN LOWER THAN FACTORY PRICE
A PAIR FOR $49.95 OR $28.95 EACH
RUGGED TOP QUALITY HI-FI WOOFER. 30cm 8 ohms ● 90 DAYS FACTORY WARRANTY ● FOAM POLY SURROUND ● STURDY SUSPENSION FOR RICH REPRODUCTION ● 3.5cm VOICE COIL ● FERRITE MAGNET ● FREQ. RESPONSE . . . 35-4500Hz. RESONANCE 35Hz.
P-P NSW FOR ONE $4.50. INTERSTATE $6.90. P-P NSW FOR TWO $6.50 INTERSTATE $8.50.

AEI BRIDGE RECTIFIER
150 piv. 10 amp.
10 FOR $14.50
P.P. NSW $2.50 INTERSTATE $3.50 OR $1.95 ea. P.P. $1.35.

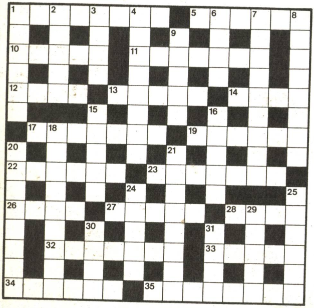
GATES CYCLON, RECHARGEABLE SEALED BATTERIES. 2 VOLT.
5 AH. X-CELL $5.95
2.5AH D-CELL $3.95
P-P N.S.W. $1.35.
INTERSTATE $2.50
CELLS ARE EX-NEW EQUIPMENT, AND ARE GUARANTEED PERFECT WILL ACCEPT FAST CHARGE.

POWER TRANSFORMER SALE
No. 1 12-0-12V .5A $2.50
No. 2. 0-18V 1.8A $4.95
No. 3. 0-12V. 1.8A $4.95
No. 4. 0-38V 2A $4.50
No. 5. 34-0-34V 1.5A $4.95
No. 6. 0-12V. 250MA $2.50
No. 7. 0-15V 1.5A 6.3V $3.50
No. 8. 0-20V 1.5A $3.50
No. 9. 7V-0-7V 10amp $25.00
No. 10. 0-14V. 10 amp $25.00
No. 11. Ferguson Lo Profile. 18V-10-CT-10-18V 40VA $12.50
Pack & Post. NSW $2.50. Interstate $3.50
P—P. Nos 9,10. NSW $5. Interstate $8.50

FEBRUARY CROSSWORD

ACROSS

1. Self-contained audio system. (8)
5. A complex radiation. (1,1,4)
10. Kind of printing wheel. (5)
11. Put into symbolic form. (7)
12. Seventh word of phonetic alphabet. (4)
13. Kind of cassette. (5)
14. Form of turntable drive. (4)
17. Common term for an electrical component. (7)
19. Developer of radar, Robert ______ -Watt. (6)
22. Components largely out of date in electronics. (6)
23. Chain of units. (7)
26. Amateur radio systems. (4)
27. Type of connecting lug. (5)
28. Term for part of a TV signal. (4)
32. Element that improves thermionic emission of tungsten. (7)
33. For some, TV games do it. (5)
34. Type of TV tuner control. (6)
35. Gas evolved when charging certain batteries. (8)



DOWN

1. A colour in the spectrum of white light. (6)
2. Initial test. (5)
3. Narrow beams of light. (4)
4. Allow excess current. (8)
6. Function, as selected on tuner, for example. (4)
7. Indicated a data location. (9)
8. You may find dynamos such! (8)
9. Examine data in sequence. (5)
15. Connected by conductors. (5)
16. D-type flip-flop. (5)
18. Kind of clip. (9)
20. What a device may do when you do 4 down. (8)
21. Access to RAMs may be made in such a way. (8)
24. Gate electrodes in a CCD filter may be so arranged. (5)
25. Shield from field. (6)
29. Proponent of the wave theory of light propagation. (5)
30. Component of certain type of speaker. (4)
31. What consists of a position and an electron? (4)

SOLUTION FOR JANUARY

V	■	F	A	B	R	I	C	A	T	I	O	N	■	T
E	■	L	■	O	■	N	■	V	■	R	■	E	■	W
C	O	U	P	L	E	D	■	I	T	E	R	A	T	E
T	■	T	■	T	■	O	■	O	■	E	■	T	■	E
O	P	T	O	■	J	O	I	N	T	■	L	E	N	Z
R	■	E	■	S	■	R	■	I	■	W	■	S	■	E
■	T	R	A	C	E	■	A	C	C	E	P	T	O	R
K	■	■	■	O	■	R	■	S	■	L	■	■	■	S
L	I	G	H	T	P	E	N	■	S	L	I	D	E	■
Y	■	R	■	T	■	S	■	S	■	S	■	I	■	G
S	P	O	T	■	P	L	A	T	E	■	B	A	S	E
T	■	U	■	K	■	E	■	A	■	E	■	L	■	I
R	U	N	T	I	M	E	■	T	I	M	E	L	A	G
O	■	D	■	L	■	V	■	I	■	I	■	E	■	E
N	■	S	E	L	F	E	X	C	I	T	E	D	■	R

EDITOR
Leo Simpson, B.Bus. (NSWIT)

ASSISTANT EDITOR
Greg Swain, B.Sc. (Hons. Sydney)

EDITORIAL CONSULTANT
Neville Williams
F.I.R.E.E (Aust.) (VK2XV)

TECHNICAL STAFF
John Clarke, B.E. (Elect. NSWIT)
Colin Dawson
Robert Flynn
Louise Upton, B.A. (Hons. Sydney)

ART DIRECTOR
Brian Jones

ART PRODUCTION
Alana Horak

SECRETARIAL
Carmel Triulcio

ADVERTISING PRODUCTION
Danny Hooper

ADVERTISING MANAGER
Selwyn Sayers

PUBLISHER
Michael Hannan

Editorial and Advertising Office: 140 Joynton Avenue (PO Box 227), Waterloo, NSW 2017. Phone: (02) 663 9999. Telex: AA74488. Facsimile: 662 1007. Representative: Norman Palmer.

Melbourne: 23rd Floor, 150 Lonsdale Street, Melbourne, Vic 3000. Phone (03) 662 1222. Represenative: John Oliver, B.A. (Hons. Essex).

Adelaide: Admedia Group, 24 Kensington Road, Rose Park, SA 5067. Phone (08) 332 8144. Representative: Steve Birbeck.

Brisbane: 25 Balaclava St, Woollangabba, Qld 4012. Phone (07) 391 8922. Representative: Bernie Summers.

Perth: Tony Allen and Associates, 7 Fore St, Perth, WA 6000. Phone (09) 328 9833. Representative: Jim Wells.

Distribution: Distributed by Gordon and Gotch Limited, Sydney.

Registered by Australia Post — publication No. NBP0240. ISSN 0313-0150.

Typeset and printed by Eastern Suburbs Newspapers, Joynton Ave, Waterloo, NSW, for The Federal Publishing Company Pty Ltd.

*Recommended and maximum price only.

©Double Bay Newspapers Pty Limited, General Newspapers Pty Limited and Suburban Publications Pty Limited (trading as "Eastern Suburbs Newspapers"), 1985.

Published by the Federal Publishing Company Pty Limited, under licence from Double Bay Newspapers Pty Limited, General Newspapers Pty Limited and Suburban Publications Pty Limited.

Electronics Australia Reader Service

"Electronics Australia" provides the following services:

BACK ISSUES: Available until stocks are depleted. Price $4 including postage and handling. When back copies are exhausted, reprints of articles may be obtained for the same cost. If the issue you require is not shown on the list below, please nominate the article you would like photocopied and the issue in which it appeared. Send cheque, money order or credit card number (American Express, Bankcard, Master Card), name and address to Federal Publishing Company, PO Box 227, Waterloo 2017.

AVAILABLE BACK ISSUES:
1981: Jun, Jul, Nov.
1982: May, Oct.
1983: Jan, Mar, Apr, May, Jul, Aug, Nov, Dec.
1984: Jan, Feb, Apr, May, Oct, Nov.
1985: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec.

PC BOARD PATTERNS: High contrast, actual size transparencies: $3, including postage. Please specify positive or negative.

PROJECT QUERIES: Members of our technical staff are not normally available to discuss individual projects, either in person at our office, or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the last three years. Charge $3. We cannot provide lengthy answers, undertake special research, or discuss design changes. Nor can we provide any information on commercial equipment.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" or submitted without fee may be answered in the "Information Centre" pages, at the discretion of the Editor.

COMPONENTS: We do not sell electronic components. Prices and specifications should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 227, Waterloo, 2017.

Total price of magazines/photocopies, including postage and handling.

Send to Elizabeth Barnett,
Direct Marketing Division,
Federal Publishing Company Pty Ltd,
PO Box 227, Waterloo 2017.

No off issues reg .... x $4 = $................

Cheque*/Money Order ☐ Please tick box to indicate method of payment:
**Please make payable to the Federal Publishing Company Pty Ltd.*

Mastercard ☐ American Express ☐ Bankcard ☐ Tick ☑

Card Expiry Date ....

Credit Card No.

Signature ....
(Unsigned Orders cannot be accepted)

NAME: ....

ADDRESS: ....

.... POSTCODE..................

ADVERTISING INDEX

Ace Radio	121
Acetronics	120
Adaptive Electronics	115
Adilam	57
Allen Bradley	55
Altronics	catalog,62
Audio Reference Technology	11
Australian School Electronics	94
Australian Government RAAF	40-41
Camlogan Nomin (Knox)	99
Commodore Business	12
Control Data	79
CQ Electronics	120
Current Solutions	107
Daneva	111
David Reid Electronics	25
Diamond Systems	94
Dick Smith Electronics	30,31,56,65, 74,95,98,103
Eastern Communication	114
East/West Electronics	55
Eclipse Computers	96
Elante	120
Elmeasco Instruments	15,69,117
Emona Enterprises	79
Federal Publishing	35,90,91
Geoff Wood	83
Gifford Productions	120
Hi-Com	120
Icom	6
IRH Components	35
Jaycar	50,51,76,77
Kalextronics	87
Kenelec	97
LE Chapman	119
Melbourne Machinery	93
Pacific Communication	118
Philips	89
Pro-Data	54
Promark	36
Raidek	OBC
RCS Radio	120
Rod Irving Electronics	22,23,70,71,92
Royston	21
Scan Audio	107
Selectronic Components	88
Scientific Devices	118
Scope	46
Sharp	IBC
Siemens	7
St. Lucia Electronics	107
Stotts Correspondence College	81
Technicraft	49
Vanfi	IFC
Viewtel	88
WIA	120

Fill your senses with astonishing Digital Sound

Sharp's DX-110 and Visual Integration Systems

Sharp's Compact Disc Players and Visual Integration Systems let you enjoy the best in State-of-the art Home Entertainment. Sharp's DX 110 has all the best features in Compact Disc Technology.

- Accurate Digital Sound with Sharp's exclusive visible-light semi-conductor laser which assures excellent durability and light-focusing ability.
- Automatic play function which means simple operation.
- Convenient Music Search: APLD (Auto Program Locate Device) and APSS (Auto Program Search System) are especially useful for locating a favourite song. Plus you have Cue and Review to find any part of the disc quickly and easily.
- Full Digital Display of all essential operating information.
- Headphone socket for private listening.
- Disc Stability which means a special vibration hold arm eliminates all external vibrations.
- Full 16 bit decoder and oversampling system means instant signal correction and optimum playback performance.
- Specifications include: 2 Stereo Channels, a frequency response of 5-20,000 Hz, a dynamic range of 96dB, Total harmonic distortion of 0.005% (at 1KHZ), C.I.R.C. Error Correction with 16 bit decoder and D/A Convertor plus oversampling system.

Sharp's brilliant Compact Disc player is just one of the latest components in Sharp's range of Visual Integration Products.

Sharp's Visual Integration Concept lets you link up your HI-FI System, Compact Disc, HI-FI Stereo Video, Stereo Television and Home Computer for the ultimate in Home Entertainment.

SHARP

Simply the best in Home Entertainment.

IF YOU'RE LISTENING TO VIDEO MOVIES IN STEREO YOU'RE MISSING HALF OF THE ACTION!!

Most stereo movie soundtracks aren't simply stereo. They are, in fact, *four* channel soundtracks which have been encoded onto two channels by a special process developed by Dolby Laboratories. The four channel soundtrack, when correctly decoded, provides not only left/right information, but also front/back information placing the listener in a three dimensional sound environment. This is not another pseudo-quadraphonic gimic — it's real 3D sound and *has to be heard* to be believed.

Try the best "Dolby Stereo" cinema in town, and then ask for a demonstration of the Raidek SD100 video movie soundtrack decoder at your favourite Hi-Fi/Video retailer. You'll find the impact of "Surround Decoded" Stereo movies is even more stunning in your own home. For just $599.00 and the cost of a modest pair of rear speakers, you can go to the movies every night of the year — you don't need a big screen, it's the big sound that puts you in the picture.

SD100 FEATURES

★ Proprietry decoder circuit provides excellent separation between output channels ★ Built–in delay line for optimum front to back separation ★ Built–in power amplifiers deliver 2 x 25 watts RMS to drive surround speakers (no additional amplifiers needed) ★ Separation enhancement circuit for improved front to back separation with poor quality soundtracks ★ Treble and bass controls for surround channel ★ Connects directly between a stereo video recorder, stereo television or video–disc player and a normal hi fi amplifier.

RAIDEK SURROUND STEREO

For further information contact:

RAIDEK SOUND INDUSTRIES PTY. LTD.
30 Williams Road, North Rocks
N.S.W. 2151 Australia.
Ph: (02) 871 7873

The Raidek SD100 video movie soundtrack decoder is designed and manufactured in Australia and is covered by an Australian patent pending. Beware of inferior so-called "Surround" systems from overseas manufacturers which do not contain the necessary decoding circuitry to produce the results described above.